ARNOLD & PORTER KAYE SCHOLER

Kohler Engines: EFI Engine Investigation

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Settlement Confidential

Report to EPA, CARB and U.S. DOJ

January 25, 2018

Agenda

- Objectives for Today and Path Forward
- Overview and Context of SSI/SORE Compliance Issues
- (b) (4) [redacted]
- Impacts and Corrective Actions
- Next Steps

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Objectives of Today's Presentation

1. Continue Cooperation and Transparency
2. Explain Facts and History Regarding Delphi EFI Engines
3. Address Key Enforcement Issues and Path Forward

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- Overview and Context of SSI/SORE Compliance Issues
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EFI Basics: Kohler SSI / SORE Engines

- Began making stand-alone gasoline small engines in 1948
- Small Spark-Ignited Engines
  - Commercial lawnmowers
  - Consumer lawnmowers
  - Generators
  - Utility vehicles
  - Zero-turn mowers
  - Welders
  - Other applications
- (b) (4) [redacted]

(b) (4) [redacted]

- Regulatory Context
  - The provisions for test cycle selection and use of governor on the test were complex and changing from Phase 1-3 and in technical amendments
  - There was also increased attention and specificity in Phase 3 rule (2007-2008) to off-cycle disclosure and limitations
- (b) (4) [redacted]

Regulatory Context: Overview

- Test Procedures
  - Test cycle selection rules
  - Governor setting provisions
- Disclosure Requirements
  - Emissions control system
  - AECDs
  - Special disclosures regarding test conditions

Regulatory Context: Test Procedures Overview of Cycle Selection

Part 90

1996

Cycle A used by default, Cycle B used if 100% of engines sold operate only at rated speed (90.119)

2006

Cycle A used if engines operate only at intermediate speed, Cycle B used if engines operate only at rated speed; if family includes engines used in both intermediate and rated speed applications, select duty cycle that will result in worst-case emissions results

"Rated speed" is speed at which manufacturer specifies maximum rated power of engine; "intermediate speed" is 85% of rated speed

Part 1054

2008

Cycle A if all engines are used in intermediate-speed equipment, Cycle B if all are used in rated-speed equipment; if family includes engines used in both, select test speed that will result in worst-case emissions

"Rated speed equipment" means intended for operation at rated speed nominally 3600 or higher; "intermediate speed equipment" means intended for operation at speeds substantially below 3600 rpm

Regulatory Context: Test Procedures (Phase 1)

- Phase 1, 60 Fed. Reg. 34,582 (July 3, 1995), 40 CFR § 90.119
  - Cycle B: Class I and II engine families in which 100% of engines are sold with governor that maintains speed within 2% of rated speed under all operating conditions may use Cycle B
  - Cycle A: All other Class I and II engine families, identical to Cycle B except run at intermediate engine speed (85% of rated speed)
  - Definitions, 40 CFR § 90.302
    - Rated speed: speed at which the manufacturer specifies the maximum rated power of an engine
    - Intermediate speed: engine speed which is 85% of rated speed
  - Governor settings, 40 CFR §§ 90.409(a)(3) and 90.410(b)
    - Option to run with fixed throttle or on governor
    - Hold speed/load within specified percent of point
- Origin, NPRM, 59 Fed. Reg. 25,399 at 25,409 (May 16, 1994)
  - SAE recommended practice, J1088
  - Weighting factors for five modes from CARB
- (b) (4) [redacted]

Regulatory Context: Test Procedures (Phase 2)

- Phase 2, 64 Fed. Reg. 15,208, 15,216 (March 30, 1999), 40 CFR § 90.409(a)(3)
  - Cycle selection unchanged
  - Voluntary In-use Testing Program
    - EPA did not require in-use testing, but preamble underlines that compliance is required for full useful life, and alternative remedial measures may be appropriate in event of non-compliance

Regulatory Context: Test Procedures (Technical Amendments - Process)

- Omnibus technical amendments for highway and nonroad engines with no preamble explanation of changes
  - Proposed rule, 69 Fed. Reg. 54,846 (Sept. 10, 2004)
  - Final rule, 70 Fed. Reg. 40,420 (July 13, 2005)
- Technical Support Document (TSD) Chapter 5 (at 46):
  - "EMA suggested EPA allow rated and intermediate speed engines in the same family and base the certification … on the worst case engine/test cycle combination. [PLT] or SEA audit tests for individual engines should be based on the intended use of the engine."
  - EPA "agree[d] that this makes sense for the main difference between these engines is the governor specification. Industry will make a fair determination of worst case for certification."

Regulatory Context: Test Procedures (Technical Amendments - Regulations)

- Codified at 40 CFR § 90.119(a)(1)(i) (2006)

  "Class I and II engines must use the test cycle that is appropriate for their application. Engines that operate only at intermediate speed must use Test Cycle A …. Engines that operate only at rated speed must use Test Cycle B…. If an engine family includes engines used in both rated-speed and intermediate-speed applications, the manufacturer must select the duty cycle that will result in worst-case emission results for certification. For any testing after certification, the engine must be tested using the most appropriate test cycle based on the engine's installed governor."

- No definitions of rated-speed and intermediate-speed applications.
- No explanation of what is most appropriate test cycle based on the engine's installed governor.

Regulatory Context: Purpose of Test Procedures (Part 1065)

- 40 CFR § 1065.10(c)(1) (2006)
  - "The objective of the procedures in this part is to produce emission measurements equivalent to those that would result from measuring emissions during in-use operation using the same engine configuration as installed in a vehicle, equipment, or vessel. However, in unusual circumstances where these procedures may result in measurements that do not represent in-use operation, you must notify us if good engineering judgment indicates that the specified procedures cause unrepresentative emission measurements for your engines. Note that you need not notify us of unrepresentative aspects of the test procedure if measured emissions are equivalent to in-use emissions."
- Preamble Explanation, 69 Fed. Reg. 54,846, 54,850 (Sept. 10, 2004) (final rule preamble)
  - "[T]esting must be conducted in a way that represents in-use engine operation, such that in the rare case where provisions in part 1065 result in unrepresentative testing, other procedures would be used."

Regulatory Context: Test Procedures (40 CFR § 1065.10)

- Origin: 67 Fed. Reg. 68,242 (Nov. 8, 2002)
  - Originally applicable only to "large nonroad spark-ignition engines and recreational vehicles."
- Updated: 70 Fed. Reg. 40,420 (July 13, 2005)
  - 40 CFR § 1065.10(c)(1) is revised to state: "The objective of the procedures in this part is to produce emission measurements equivalent to those that would result from measuring emissions during in-use operation."
  - In EPA's response to comments from the Engine Manufacturers Association, the agency noted that this statement is designed to "discourage manufacturers from considering only the specified test procedures, rather than in-use performance, when designing their emission controls."
  - 40 CFR § 1065 remained applicable at that time only to large nonroad spark-ignition engines and recreational vehicles.
- Updated: 73 Fed. Reg. 59,034 (Oct. 8, 2008)
  - 40 CFR § 1065.1 amended to apply the regulations under 40 CFR Part 1054 to "small nonroad spark-ignition engines."

Regulatory Context: Test Procedures (Phase 3 – Test Cycle Selection)

- Cycle Selection, 40 CFR § 1054.505(d)(1)

  "In normal circumstances, select a test speed of either 3060 rpm or 3600 rpm that is most appropriate for the engine family. If all the engines in the engine family are used in intermediate-speed equipment, select a test speed of 3060 rpm [Cycle A]. If all the engines in the engine family are used in rated-speed equipment, select a test speed of 3600 rpm [Cycle B]. If an engine family includes engines used in both intermediate-speed and rated-speed equipment, select the test speed for emission-data engines that will result in worst-case emissions. In unusual circumstances, you may ask us to use a test speed different than that specified in this paragraph (d)(1) if it better represents in-use operation."

- Definitions, 40 CFR § 1054.801
  - Rated-speed equipment means "nonroad equipment in which the installed engine is intended for operation at a rated speed that is nominally 3600 rpm or higher."
  - Intermediate-speed equipment means "nonroad equipment in which the installed engine is intended for operation at speeds substantially below 3600 rpm."

- Process
  - NRPM, 72 Fed. Reg. 28,098 (May 18, 2007); FRM, 64 Fed. Reg. 72 Fed. Reg. 28,098 (May 18, 2007) (New Part 1054, Applicable Beginning in 2011)
  - Preambles clarify that moving from "rated speed" and "intermediate speed" to specific rpm of 3600 and 3060 is "more objective." 72 Fed. Reg. at 28,148
  - No explanation of definitions, intended operation, or "substantially below 3600 rpm"

Regulatory Context: Test Procedures (Test Cycle Selection Agreement)

- Gap/ambiguity exists regarding intended speed of engine operation below 3600 rpm
- After multiple meetings in 2016, Kohler, EPA, and CARB agreed on an approach to cycle selection criteria
- 07/15/2016 Appendix C-1 Kohler Proposal for Cycle Determination Procedure [Tab 82]

Part 1054 certified engine family cycle selection decision matrix:

1) Is an engine model selected for the certification the parent rating? Does the rated engine model have the highest kW, torque and fueling among an engine family?
   a) Based upon 1065.401(b)
2) Determine all the engine model specifications in terms of "HSNL" for a given engine family. Calculate "HSFL" (High Speed Full Load) through the measured governor droop. Then determine:
   a) Cycle A, if ALL the HSFL < 3330 rpm.
   b) Cycle B, if ALL the HSFL ≥ 3330 rpm.
3) For an engine family parent rating determined in Step 1, identify HSNL specification based upon appropriate combination of highest sales volume and maximum in-use speed.
4) Perform DF service accumulation and certification testing on HSNL specification determined in step 3.

Regulatory Context: Test Procedures Overview of Governor Provisions

Part 90:
Phase 1 engines could be tested with fixed throttle or installed governor, Phase 2 engines with governor must be tested with governor except Modes 1 and 6. Controller may be used to adjust governor speed setting for Modes 2-5. (90.409(a))

Part 1054 (proposed 2007):
Testing at wide-open throttle ungoverned, at other modes with governor. Manufacturers may adjust governor to target speeds, or let governor control speed. (1054.505)

Part 1054 (final rule 2008):
Adopts proposal and adds provision that EPA will test on governor. (1054.505(b))

Regulatory Context: Test Procedures (Phase 1 & 2 – Governor)

- Phase 1 allowed use of throttle controller to maintain speed and load for test cycle, but task group formed by Reg Neg committee recognized governor may be a more accurate prediction of an engine's in-use performance
- Phase 2 rule allows fixed throttle for 100% load to ensure consistent and repeatable method, and then use governor for other power modes except idle, with governor setpoint adjusted for 100% or 85% of rated speed (Cycle B and Cycle A)
- Explained in proposal, 63 Fed. Reg. 3,950, 3,976 (Jan. 27, 1998)

Regulatory Context: Test Procedures (Phase 3 – Governor)

- Governor, 40 CFR § 1054.505(b)(2) and (d)(2)
  - "Control engine speeds and torques during idle mode as specified in paragraph (c) … and during full-load operating modes as specified in paragraph (d)…. For all other modes … control the engine speed to within 5 percent of the nominal speed specified in paragraph (d) … or let the installed governor (in the production configuration) control engine speed. The governor may be adjusted before emission sampling to target the nominal speed … but the installed governor must control engine speed throughout the emission-sampling period whether the governor is adjusted or not."
  - "Operate the engine ungoverned at wide-open throttle at the test speed established in paragraph (d)(1)…. Use this value for the full-load torque setting and for denormalizing the rest of the duty cycle."
- Preamble Explanations
  - Operate ungoverned at WOT for full-power mode, with governor at idle, and test at other modes with governor controlling speed. Before other test modes, manufacturers *may* adjust governor to target nominal speed used for full-power mode, or let the installed governor control engine speed. 72 Fed. Reg. at 28,148 (proposal); 73 Fed. Reg. at 59,083 (final rule).
  - "Any EPA testing will be done only with the installed governors controlling engine speed in the standard configuration, regardless of the method used by manufacturers for their own testing." 73 Fed. Reg. at 59,084.

Regulatory Context: Disclosures Overview of Provisions

Part 90:

Explanation of how emissions control system operates, including a detailed description of emissions control system components, including AECDs

Prohibition on defeat devices

Part 1054:

Similar to Part 90, includes requirement to include sufficient detail to show how AECDs are not defeat devices

Prohibition on defeat devices

Regulatory Context: Disclosures (Phases 1 & 2 – Part 90)

- Description of Emission Control System, 40 CFR § 90.107(d)(2)

  "An explanation of how the emission control system operates, including a detailed description of all emission control system components (Detailed component calibrations are not required to be included; they must be provided upon request, however, each auxiliary emission control device (AECD), and all fuel system components to be installed on any production or test engine(s)."

- "Defeat Device" Prohibition, 40 CFR § 90.111

  (a) "An engine may not be equipped with a defeat device.

  (b) … 'Defeat device' means any device, system or element of design which senses operation outside normal emission test conditions and reduces emission control effectiveness.

  (1) Defeat device includes any [AECD] that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal operation and use unless such conditions are included in the test procedure.

  (2) Defeat device does not include such items which either operate only during engine starting or are necessary to protect the engine … against damage or accident during its operation.

- No Changes in Phase 2

Regulations: Disclosures (Phase 3 – Part 1054)

- Description of Emission Control System, 40 CFR § 1054.205(b)

  "Explain how the emissions control systems operate…. [D]escribe in detail all system components for controlling exhaust emissions, including all [AECDs] and all fuel-system components you will install on any production or test engine…. Include sufficient detail to allow us to evaluate whether the AECDs are consistent with the defeat device prohibition of § 1054.115. *For example, if your engines will routinely experience in-use operation that differs from the specified duty cycle for certification, describe how the fuel-metering system responds to varying speeds and loads not represented by the duty cycle. If you test an emission-data engine by disabling the governor for full-load operation such that the engine operates at an air-fuel ratio significantly different than under full-load operation with an installed governor, explain why these differences are necessary or appropriate.* For conventional carbureted engines without electronic fuel controls, it is sufficient to state that there is no significant difference in air-fuel ratios." (emphasis added)

Regulations: Disclosures (Phase 3 – Part 1054)

- Defeat Device Prohibition, 40 CFR § 1054.115(e)

  "You may not equip your engines with a defeat device. A defeat device is an [AECD] that reduces the effectiveness of emission controls under conditions that the engine may reasonably be expected to encounter during normal operation and use…. This [] does not apply to [AECDs] you identify in your application for certification if any of the following is true:

  (1) The conditions of concern were substantially included in the applicable duty-cycle test procedures described in subpart F of this part.

  (2) You show your design is necessary to prevent engine (or equipment) damage or accidents.

  (3) The reduced effectiveness applies only to starting the engine."

Regulations: Disclosures (Phase 3 – Part 1054)

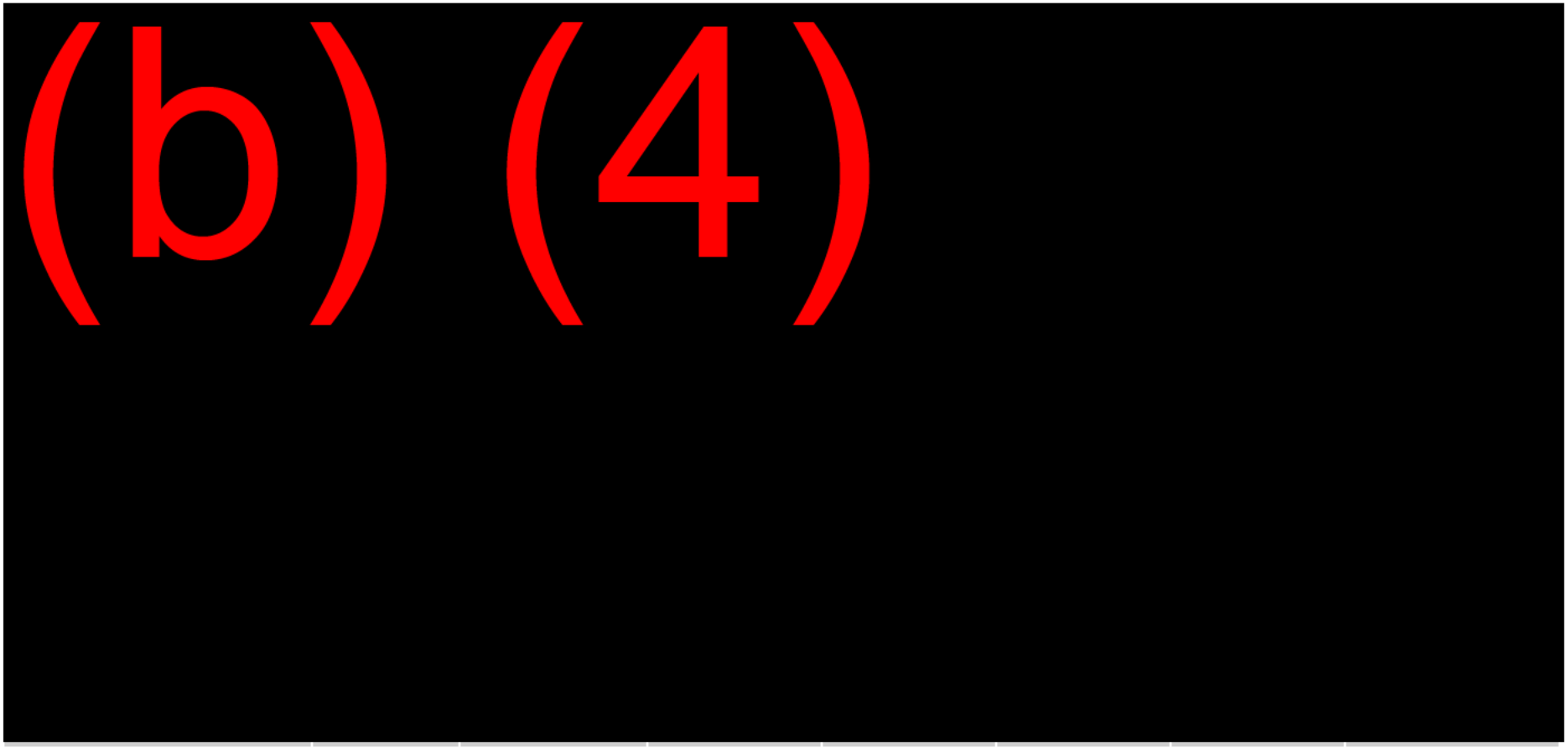
- Preamble Explanation, 73 Fed. Reg. at 59,084 (final rule preamble)

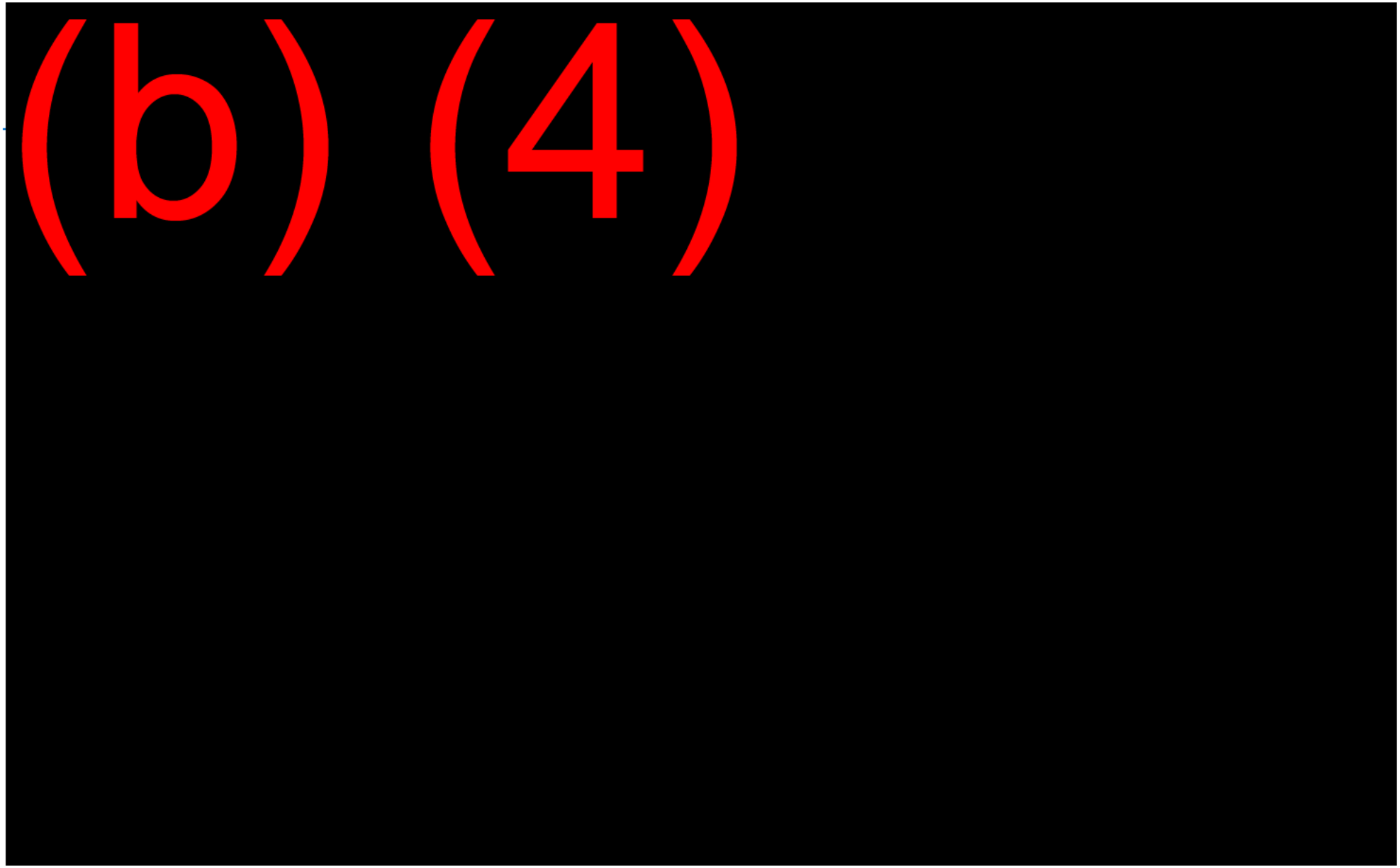
  "To avoid a situation where engines are designed to control emissions over the test cycle, with less effective controls under similar modes of operation that engines experience in use, *we are adding a requirement for manufacturers to provide an explanation in the application for certification if air-fuel ratios are significantly different for governed and ungoverned operation at wide-open throttle, especially for fuel-injected engines*. Manufacturers would need to explain why this emission control strategy is not a defeat device. If we test engines governed and ungoverned at [WOT], we would expect to see little or no difference in emission rates. If we would observe higher emission rates with governed engine operation, manufacturers would again need to justify why this discrepancy is not a defeat device. Engines with conventional carburetors offer a limited ability to manipulate air-fuel ratios at different operating points, so in these cases manufacturers would simply state that air-fuel ratios do not vary significantly at governed and ungoverned points of full-load operation." (Emphasis added.)

The Revoked Delphi EFI Families

Family	Original FEL (EPA)	HC+NOx (old cal on Cycle B)	HC+NOx (new cal on Cycle B)
6942PC	8.8	12.85	8.57
7472NC	8.0	14.81	5.79
7472ND	8.0	16.00	8.32
8242ND	8.0	17.62	6.87
8242PD	8.5	14.25	6.13

Engine Volumes (MY 2011-2016)

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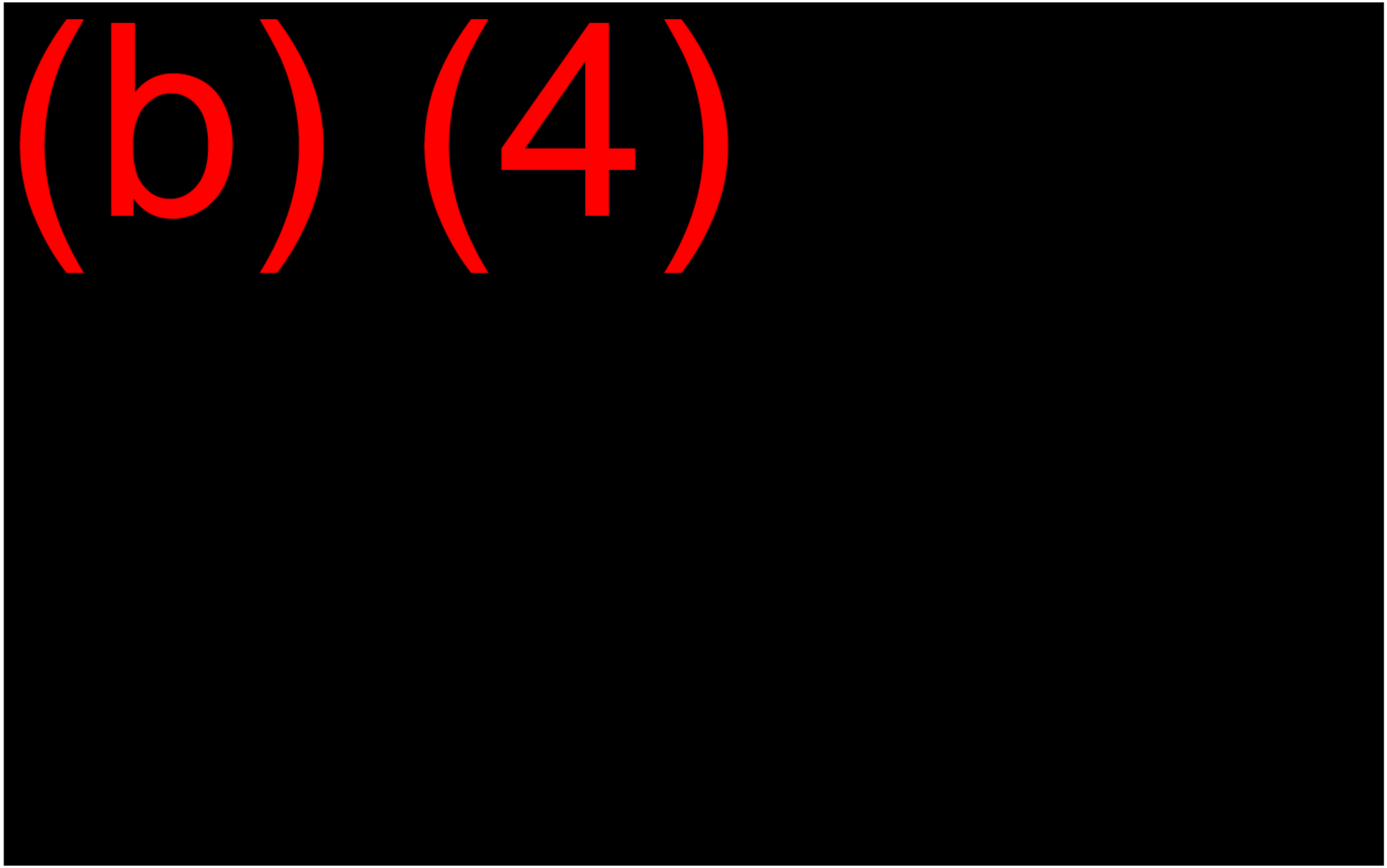
Self-Disclosure and Enforcement Process

- December 24, 2015: Self-Disclosure
  - (b) (4) [redacted]
- 2016-2017 Process
  - Agencies' preference to defer enforcement until complete data gathered
  - April 7, 2016 meeting to explain EFI calibrations (and April 11 submission of calibration diagrams)
- (b) (4) [redacted]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2016-2017 Steps

- (b) (4) [redacted]
- (b) (4) [redacted]
- Submitted Responses to Government Information Requests
  - Section 208 request July 28, 2016
  - Section 208 request June 19, 2017
  - CARB information request August 7, 2017
  - Kohler has also responded to numerous follow-up requests for information

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- (b) (4) [redacted]
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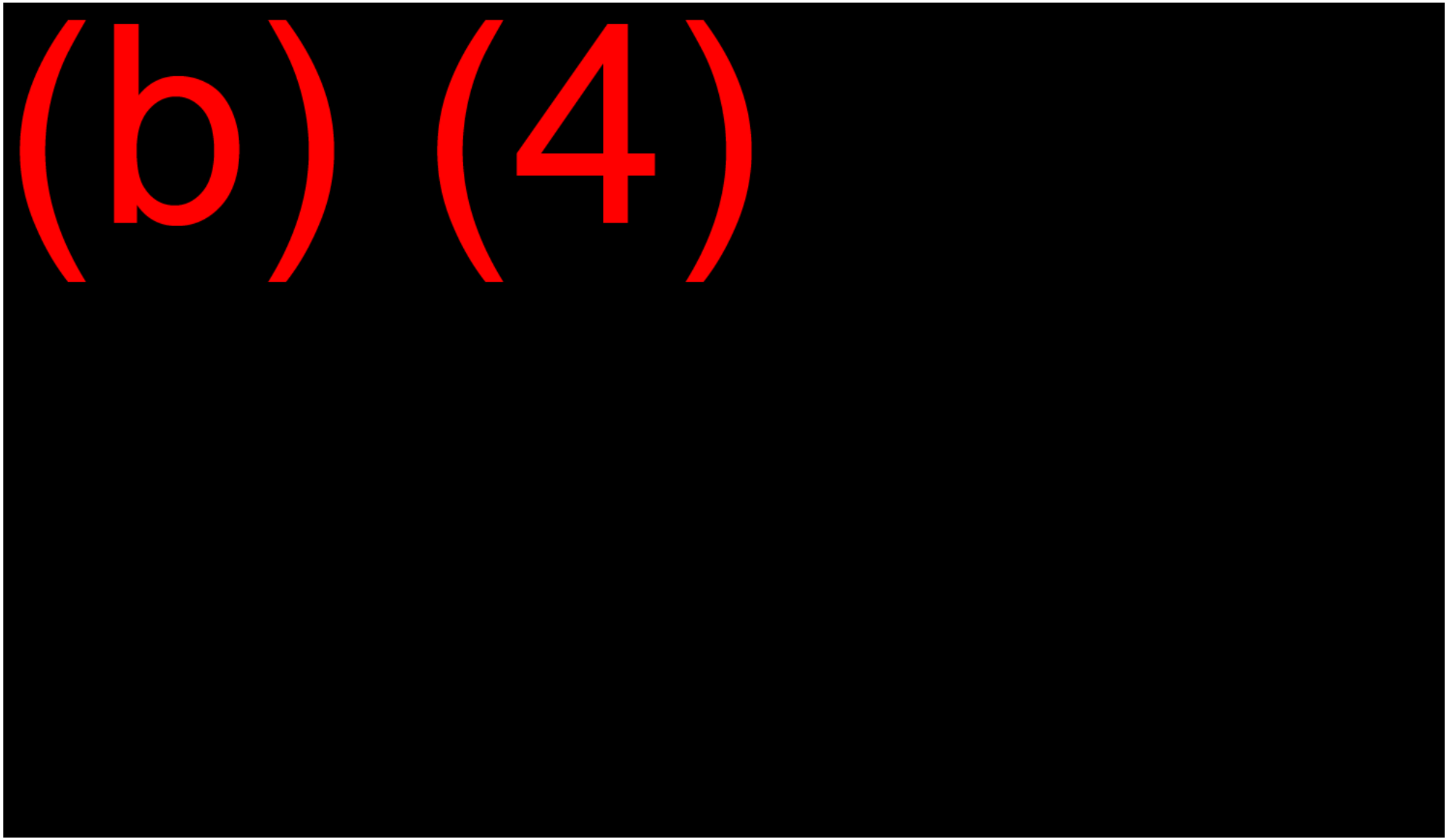
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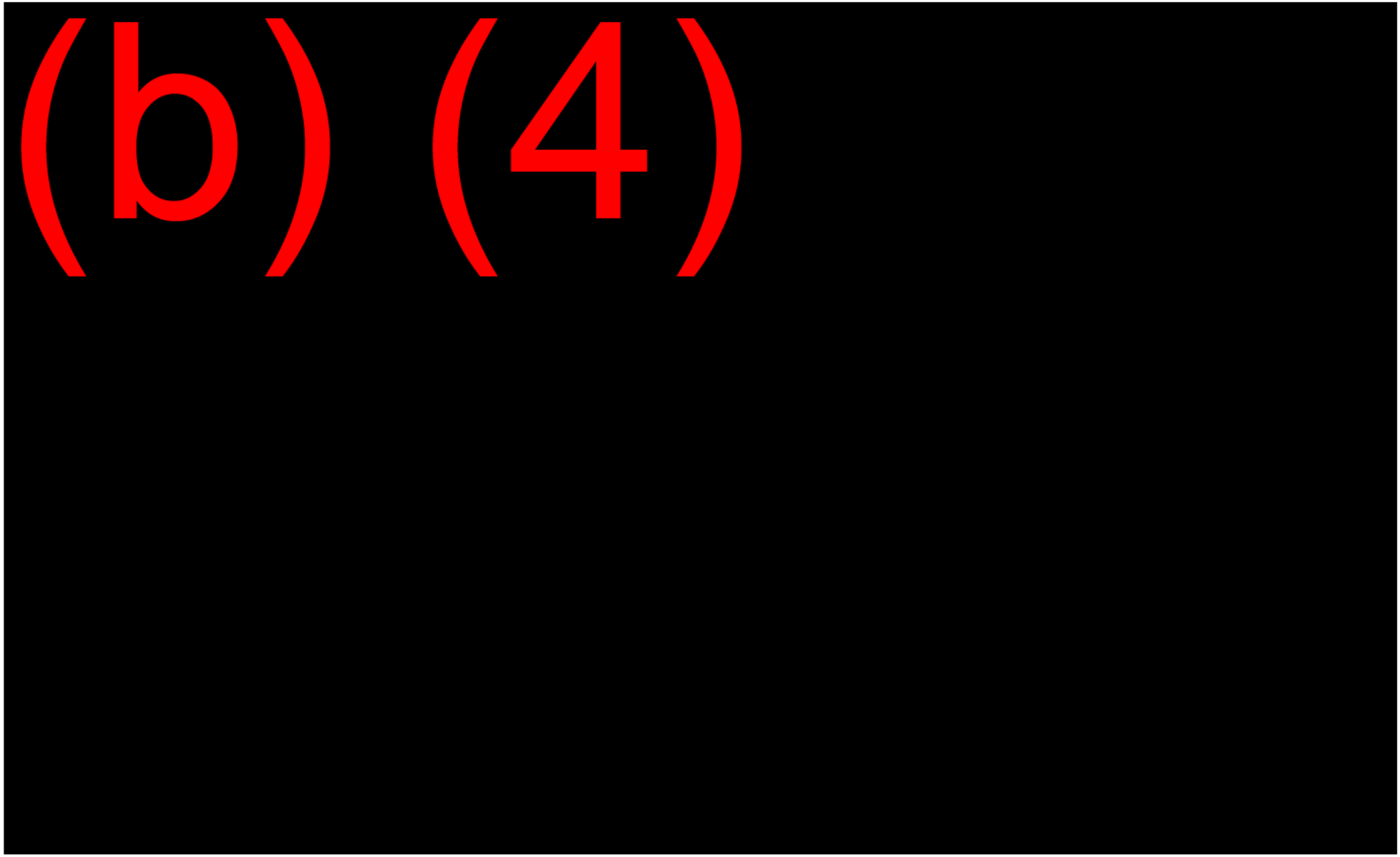
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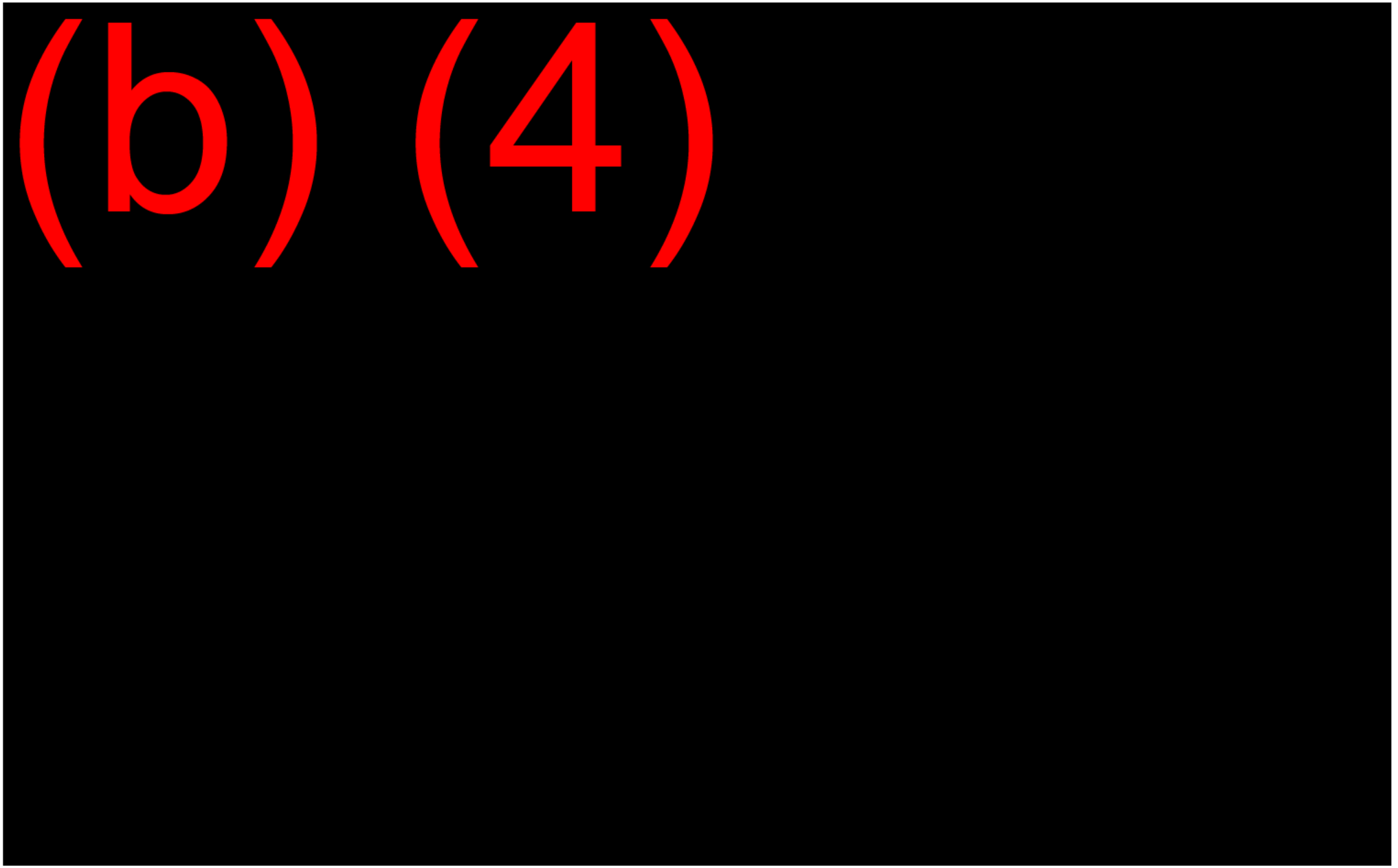
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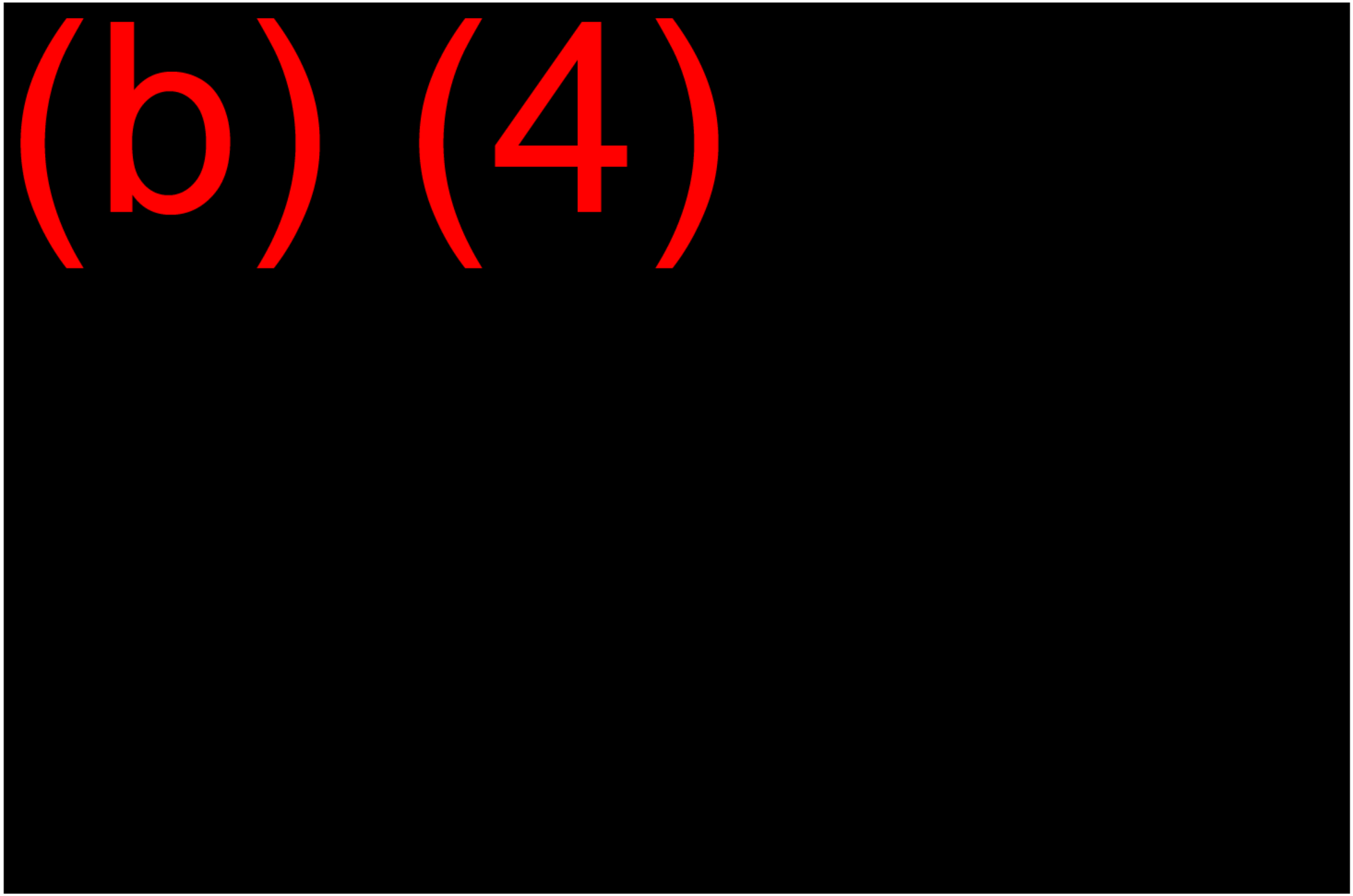
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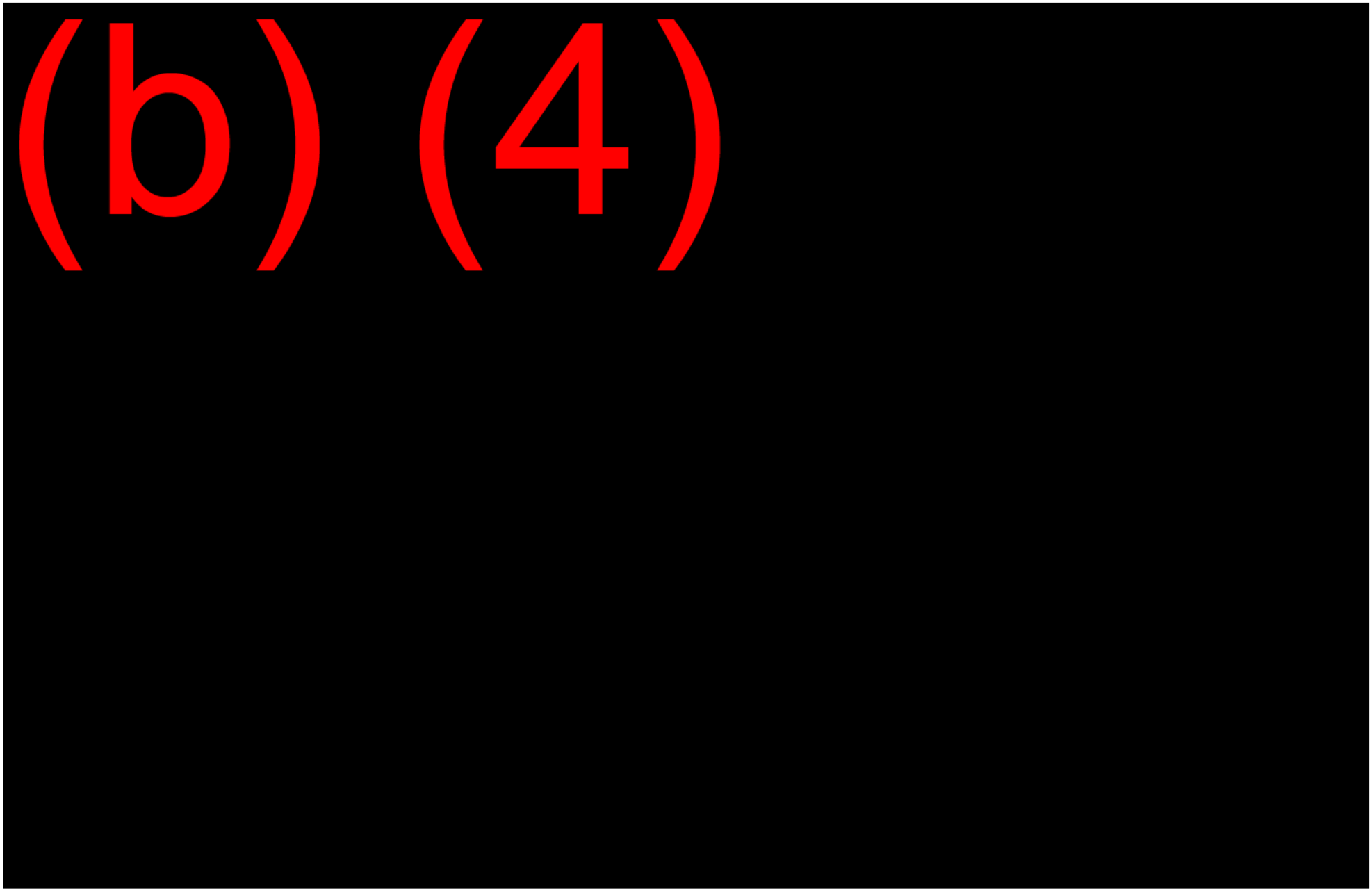
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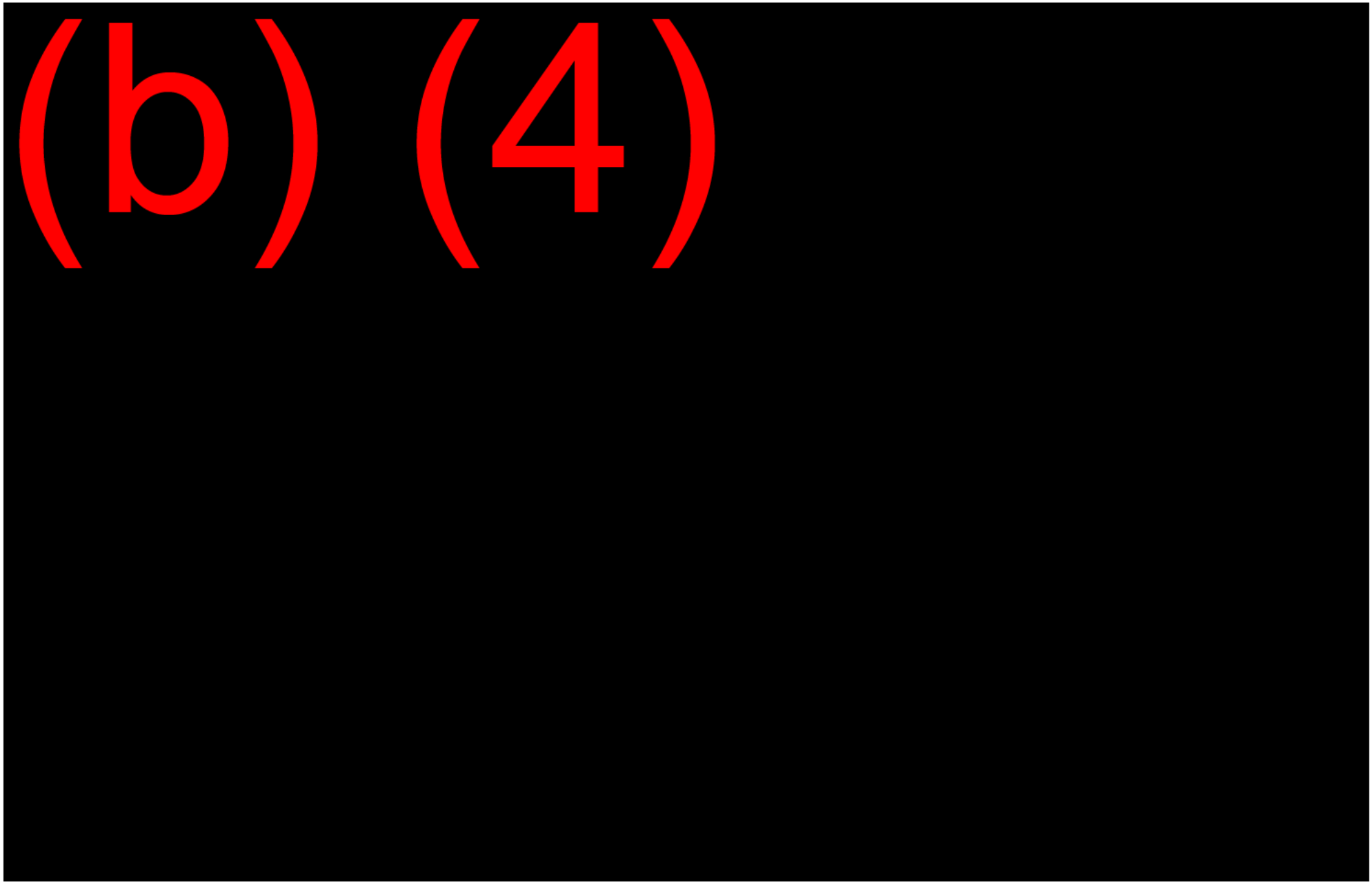
(b) (4) [redacted]

- (b) (4) [redacted]
- Regulatory Context
  - Test cycle selection: All SSI/SORE engines tested at constant speed of 3060 rpm (without engine speed governor)
  - AECD and disclosure provisions
  - Certification
- (b) (4) [redacted]
- (b) (4) [redacted]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EFI Basics: Initial (b) (4) Design

- (b) (4)
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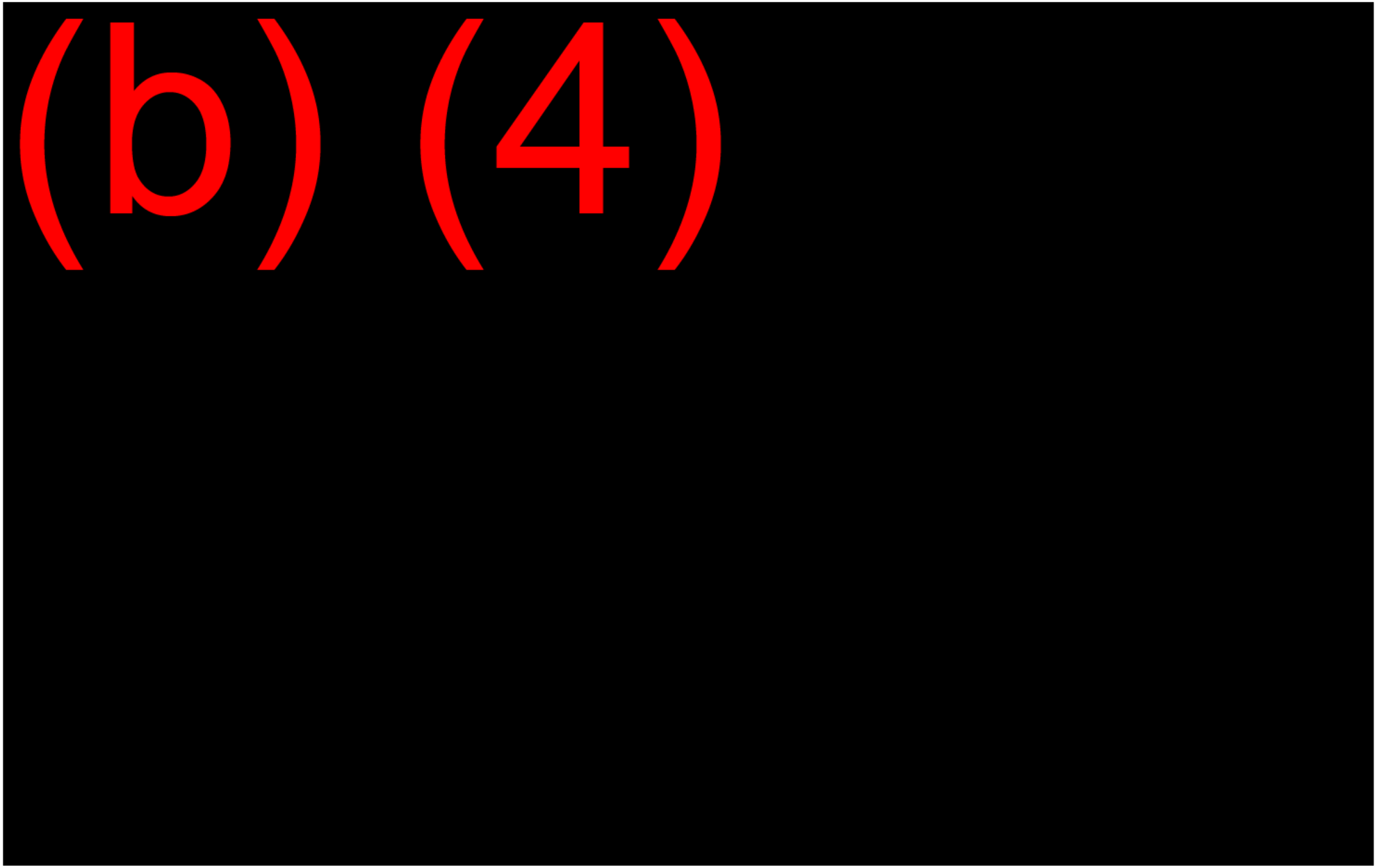
- Emissions (Appendix D data) (Tab 83)
  - 7472PH: 6.94 g/kW-h (Cycle A), 6.97 & 6.98 g/kW-h (Cycle B)
  - 7472PM: 9.69 g/kW-h (Cycle A), 8.15 & 8.73 g/kW-h (Cycle B)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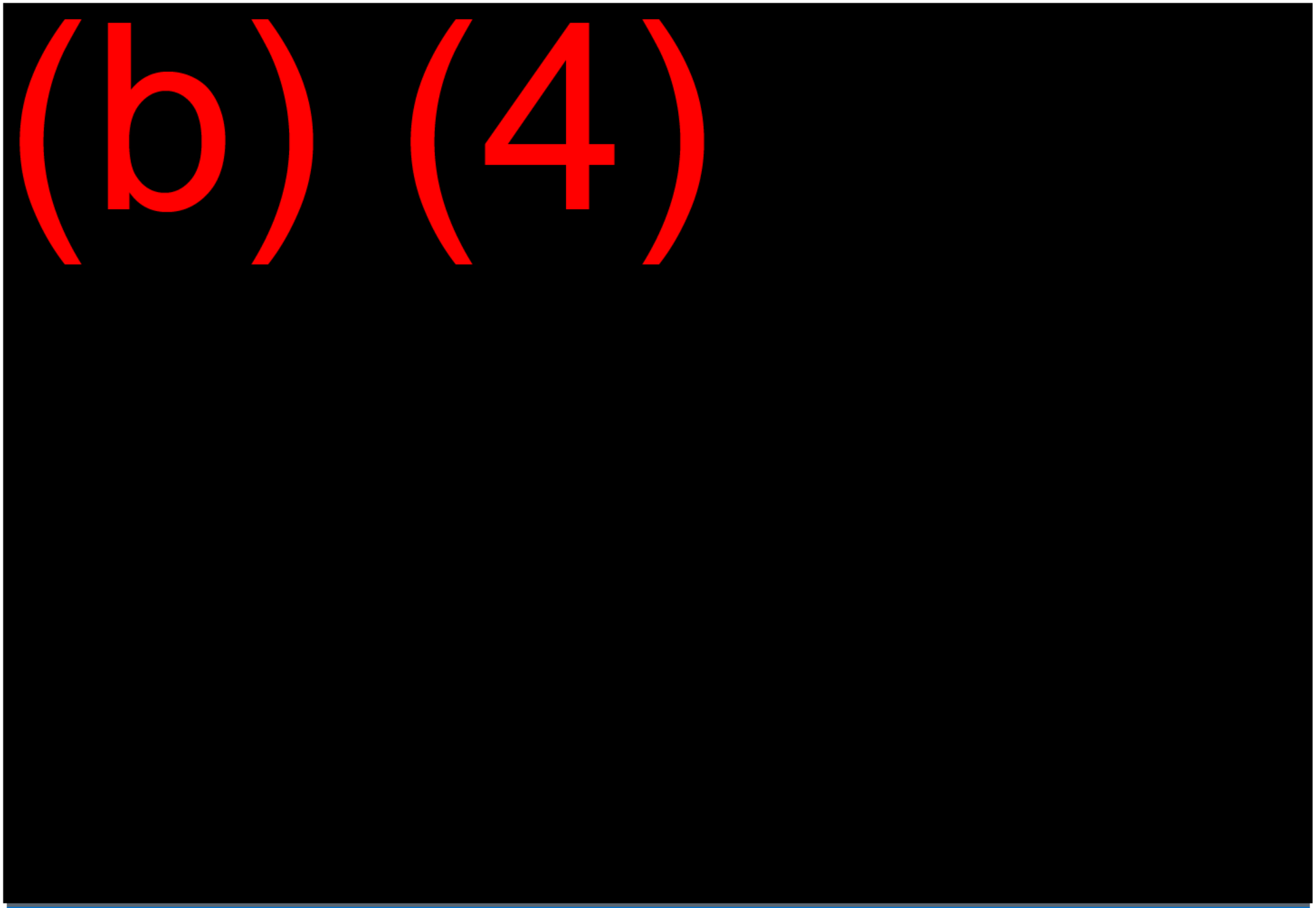
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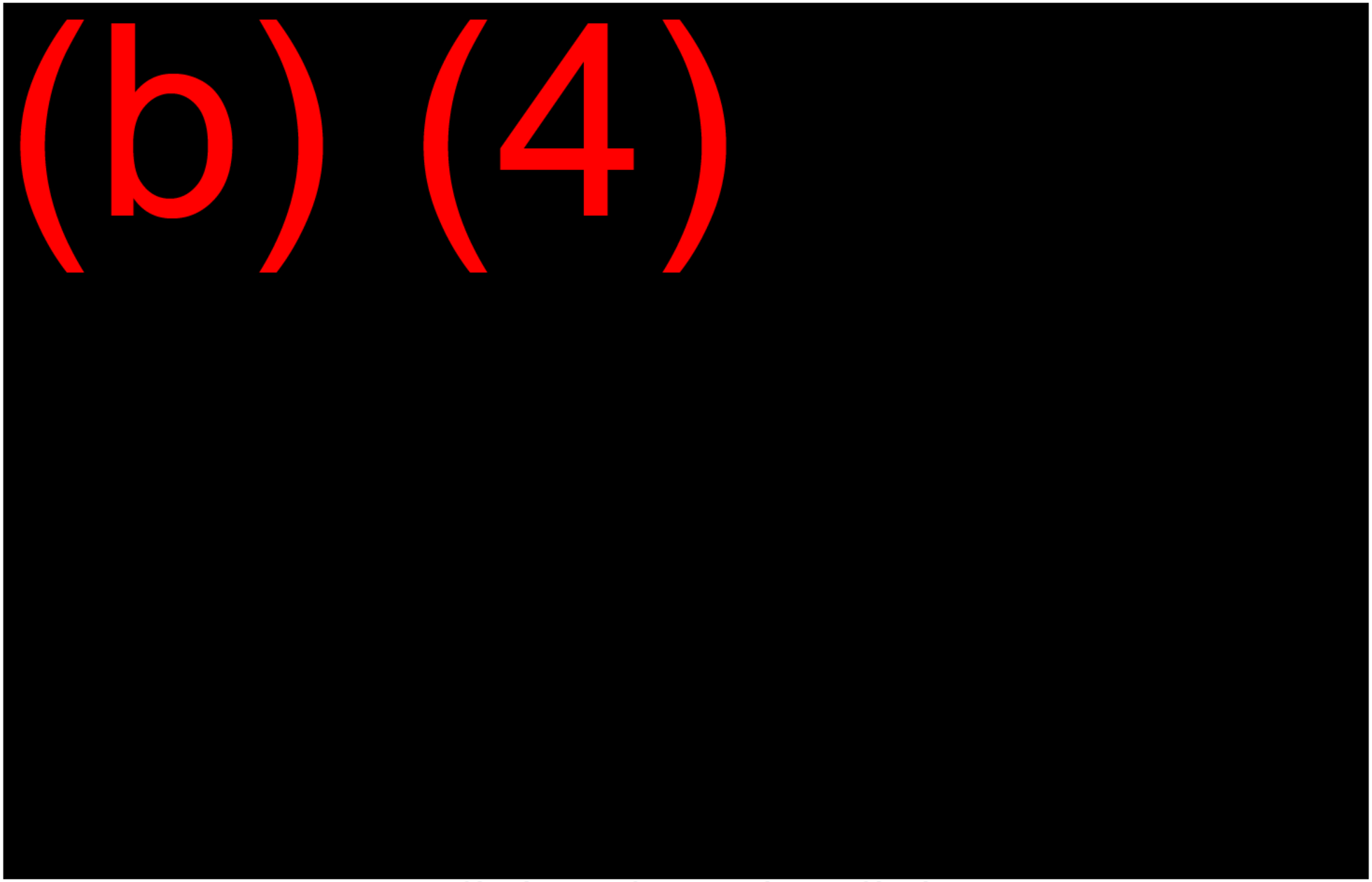
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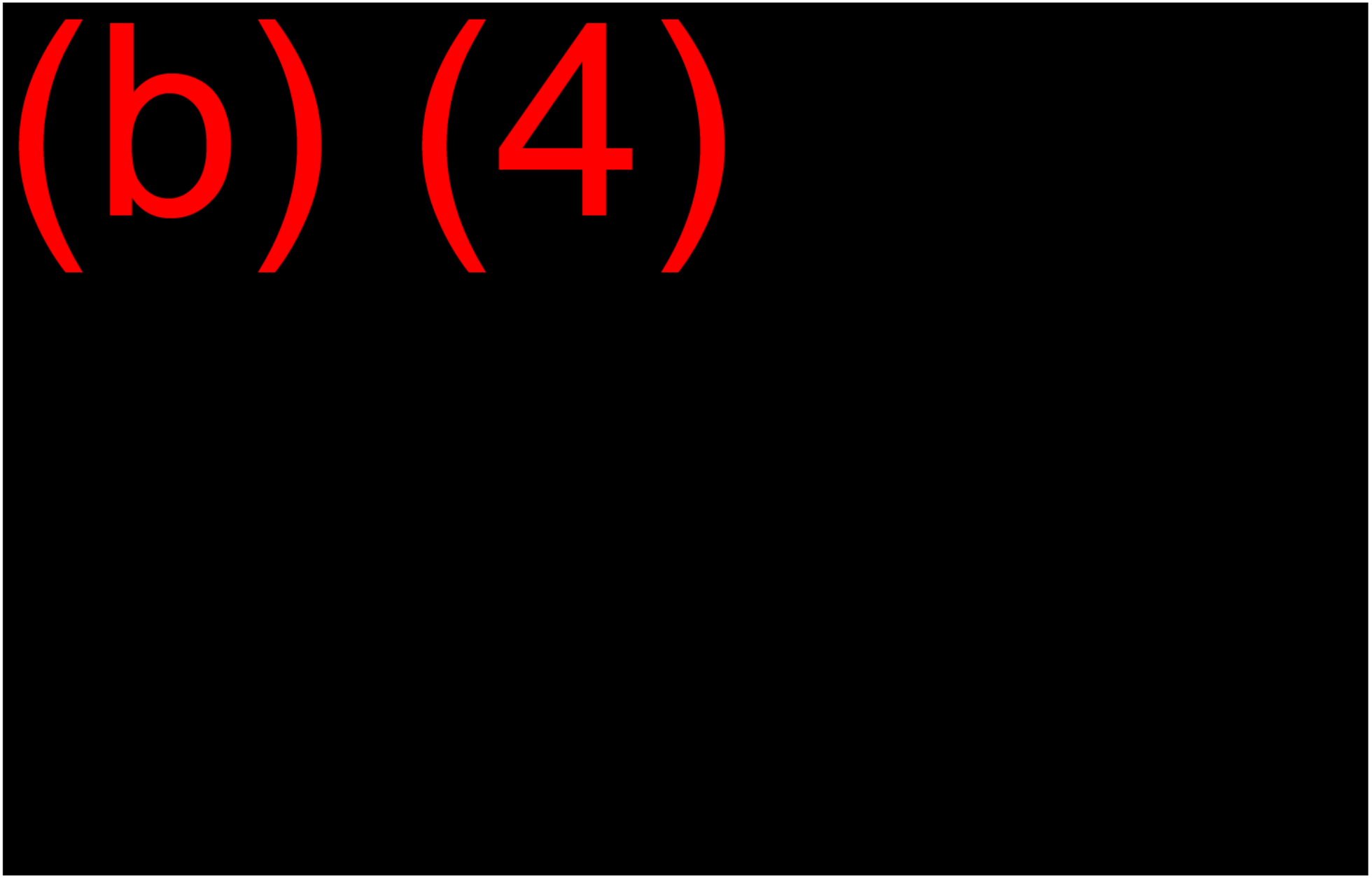
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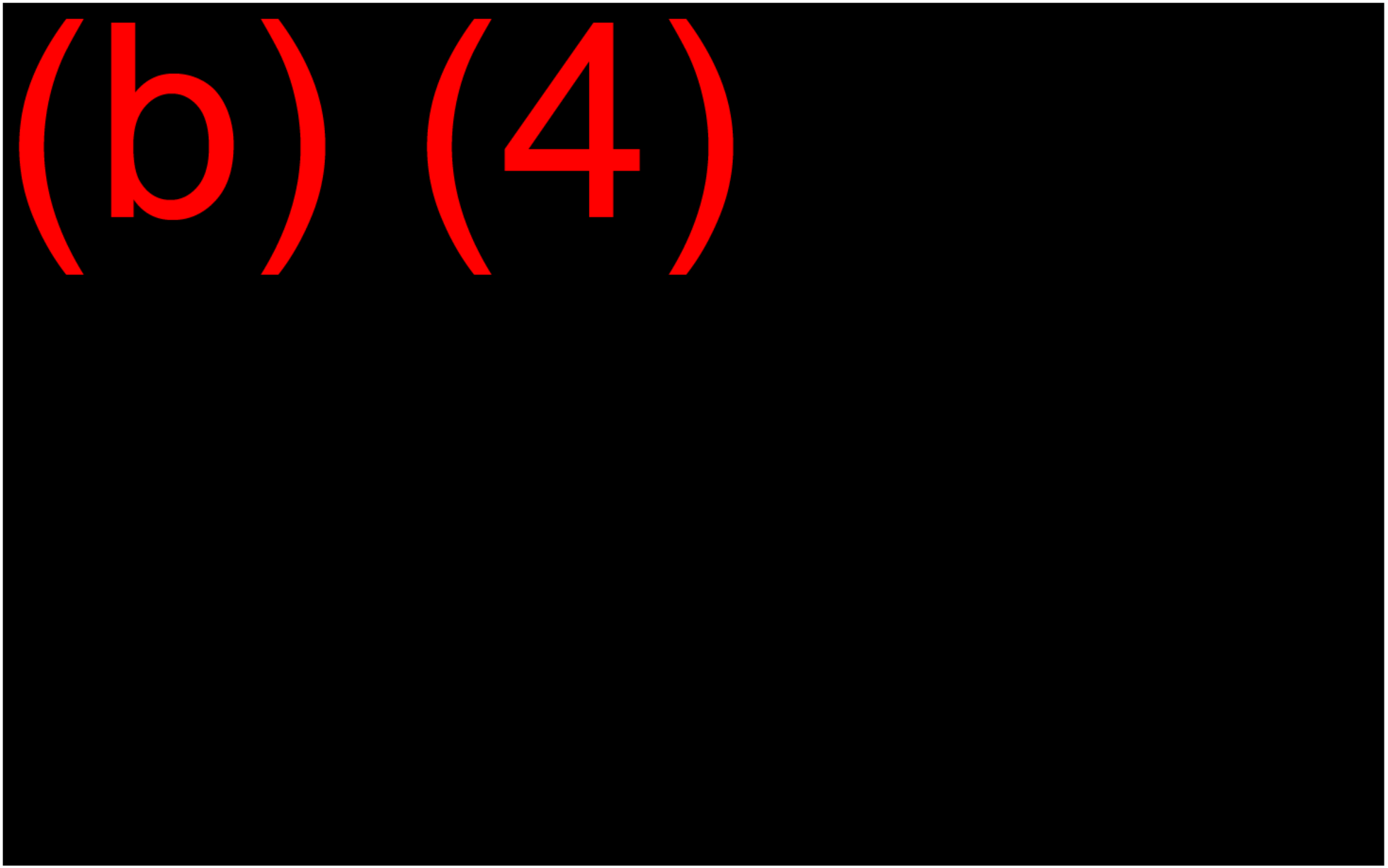
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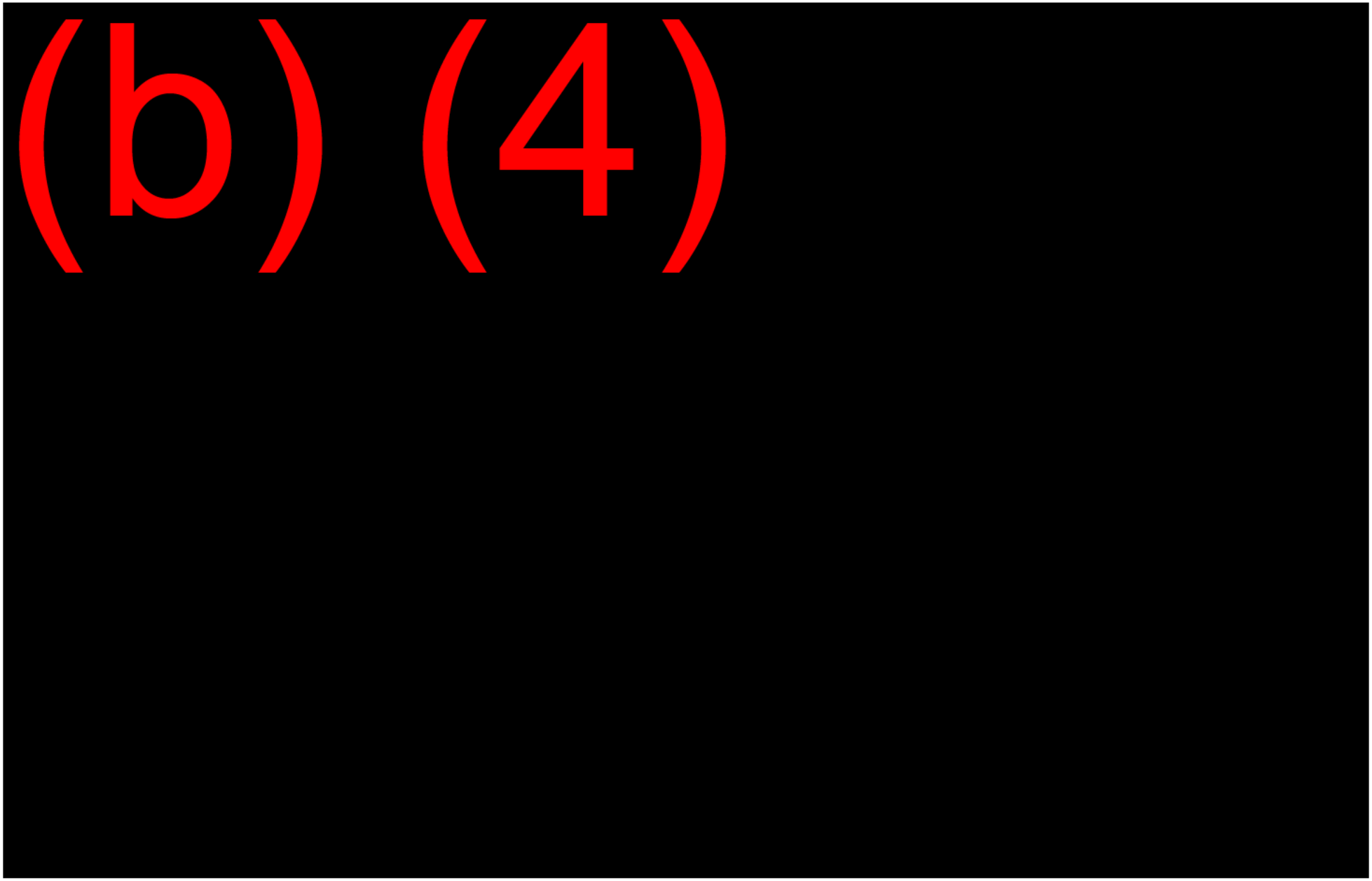
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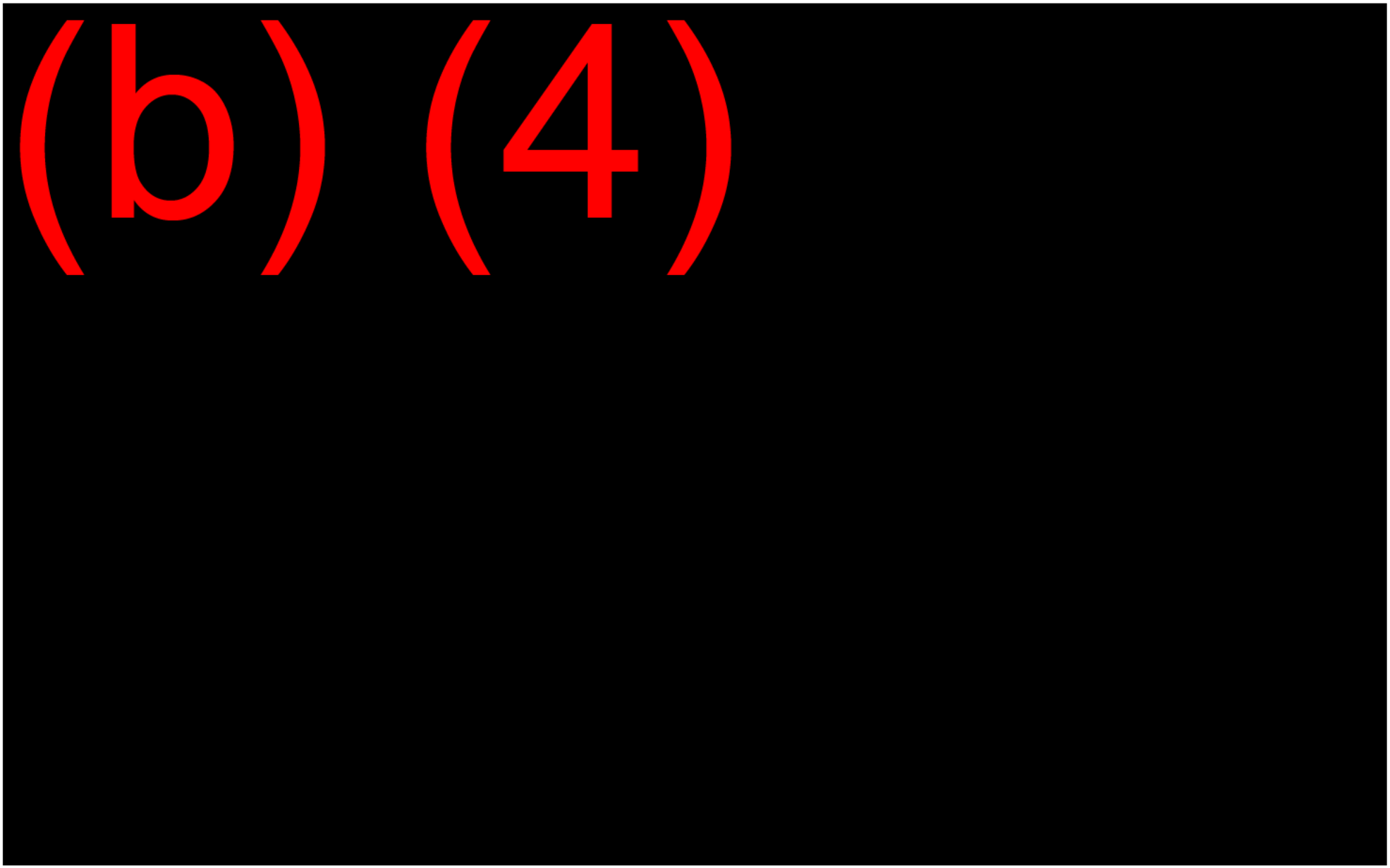
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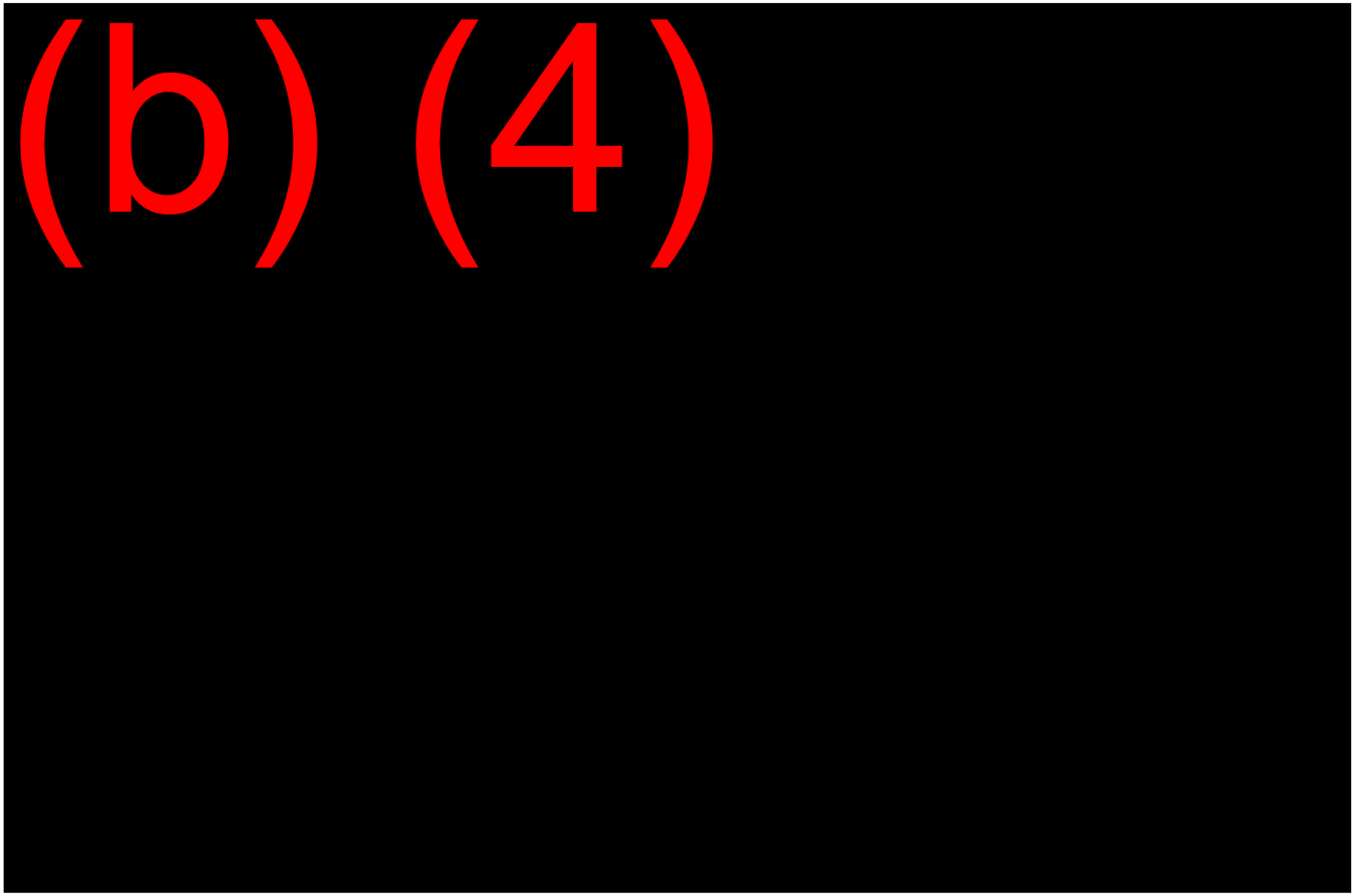
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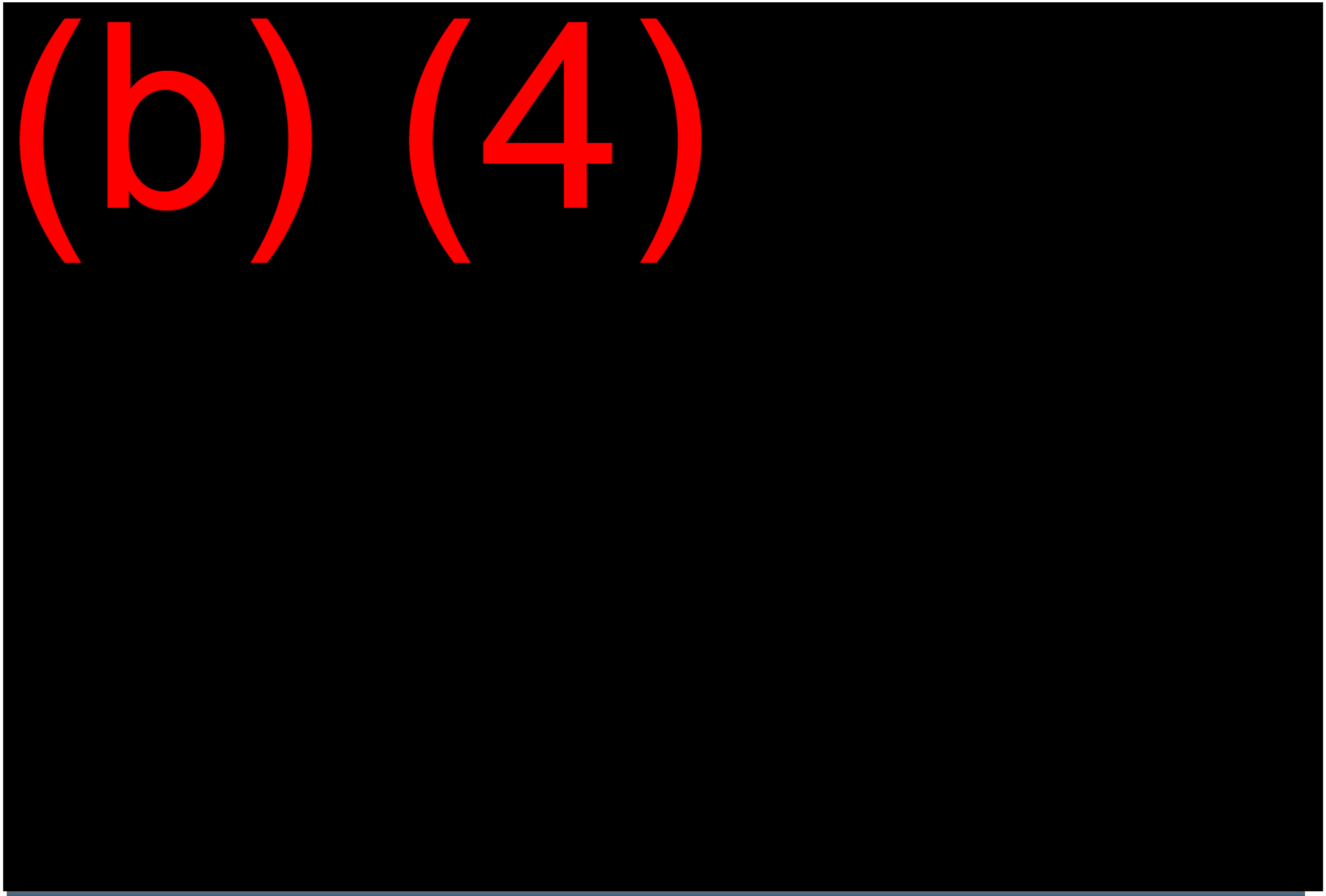
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Calibration: Emissions

- 12/19/08 Emissions Tests at 3060 and 3600 rpm [Tab 15]

Test Number : 2008-48-13-K testcell #3
Operator : Timm
ECV750-011 DV2 EFI Calibration Development
Emission test from 3060; DV3 heads
(b) (4) _CV749_Dec17_MR
Command 10w-30; EEE fuel
Post Test Zero 0.00 Span 51.7 Ft-lbs (51.7)

Emissions Cycle Summary (Utility - 6 mode)					(units are g/kW-hr & kW)		
	CO	HC+NOxC	HC	NOxC	O2	CO2	(b) (4)
Carb & EPA	119.8444	8.9353	2.2663	6.6689	44.2962	1061.2444	
Europe	120.1929	8.0569	2.2829	5.774	44.4262	1064.3666	

ECV750-011 DV2 EFI Calibration Development
Emission test from 3600; DV3 heads
(b) (4) _CV749_Dec17_MR
Command 10w-30; EEE fuel
Post Test Zero 0.00 Span 51.7 Ft-lbs (51.7)

Emissions Cycle Summary (Utility - 6 mode)					(units are g/kW-hr & kW)		
	CO	HC+NOxC	HC	NOxC	O2	CO2	(b) (4)
Carb & EPA	146.9886	8.8101	2.3962	6.4139	44.0304	1068.4236	
Europe	147.4116	7.9452	2.4136	5.5316	44.158	1071.5264	

Calibration: Emissions

- 2/6/09 Development Tests at 3060 and 3600 rpm [Tab 15]

Test Number : 2008-48-13-SS			testcell #12				
Operator : Timm							
ECV750-011 DV2 EFI Calibration Development							
Emission test from 3060; DV3 heads	**prod intake & Flywheel**						
(b) (4) _CV749_Feb5F_MR							
Command 10w-30; EEE fuel							
Post Test Zero 0.00 Span 41.7 Ft-lbs (41.8)							
Emissions Cycle Summary (Utility - 6 mode)					**(units are g/kW-hr & kW)**		
	CO	HC+NOxC	HC	NOxC	O2	CO2	(b) (4)
Carb & EPA	262.665	6.2347	3.0994	3.1354	22.2469	977.9226	
Europe	263.3278	5.849	3.1221	2.7269	22.3095	980.5999	

Test Number : 2008-48-13-TT			testcell #12				
Operator : Timm							
ECV750-011 DV2 EFI Calibration Development							
Emission test from 3600 (1200 idle) ; DV3 heads	**prod intake & Flywheel**						
(b) (4) _CV749_Feb5F_MR							
Command 10w-30; EEE fuel							
Post Test Zero 0.00 Span 41.7 Ft-lbs (51.8)							
Emissions Cycle Summary (Utility - 6 mode)					**(units are g/kW-hr & kW)**		
	CO	HC+NOxC	HC	NOxC	O2	CO2	(b) (4)
Carb & EPA	139.1485	8.3434	1.7191	6.6243	26.002	1105.8839	
Europe	139.5194	7.5481	1.7326	5.8155	26.0792	1109.0888	

Calibration: Emissions

Fix tab#

- 12/10/09 Emissions Data Comparisons at 3060 and 3600 rpm (Tab 30)

(b) (4)

Results - use this section to show tables and summarize results - an example is shown

		(units in g/kw-hr & kw)						
Test #	Carb #	CO	HC+NOx	HC	NOx	O2	CO2	kw
3600 EMI		136.8144	8.028	1.6722	6.3558	25.8532	1174.531	7.3361
3060 EMI		276.5304	5.9473	3.0057	2.9415	18.6124	1035.823	6.5867
3060 Wot		122.978	8.4648	1.53	6.9348	32.2764	1137.402	7.7022

Calibration: Emissions

(b) (4)

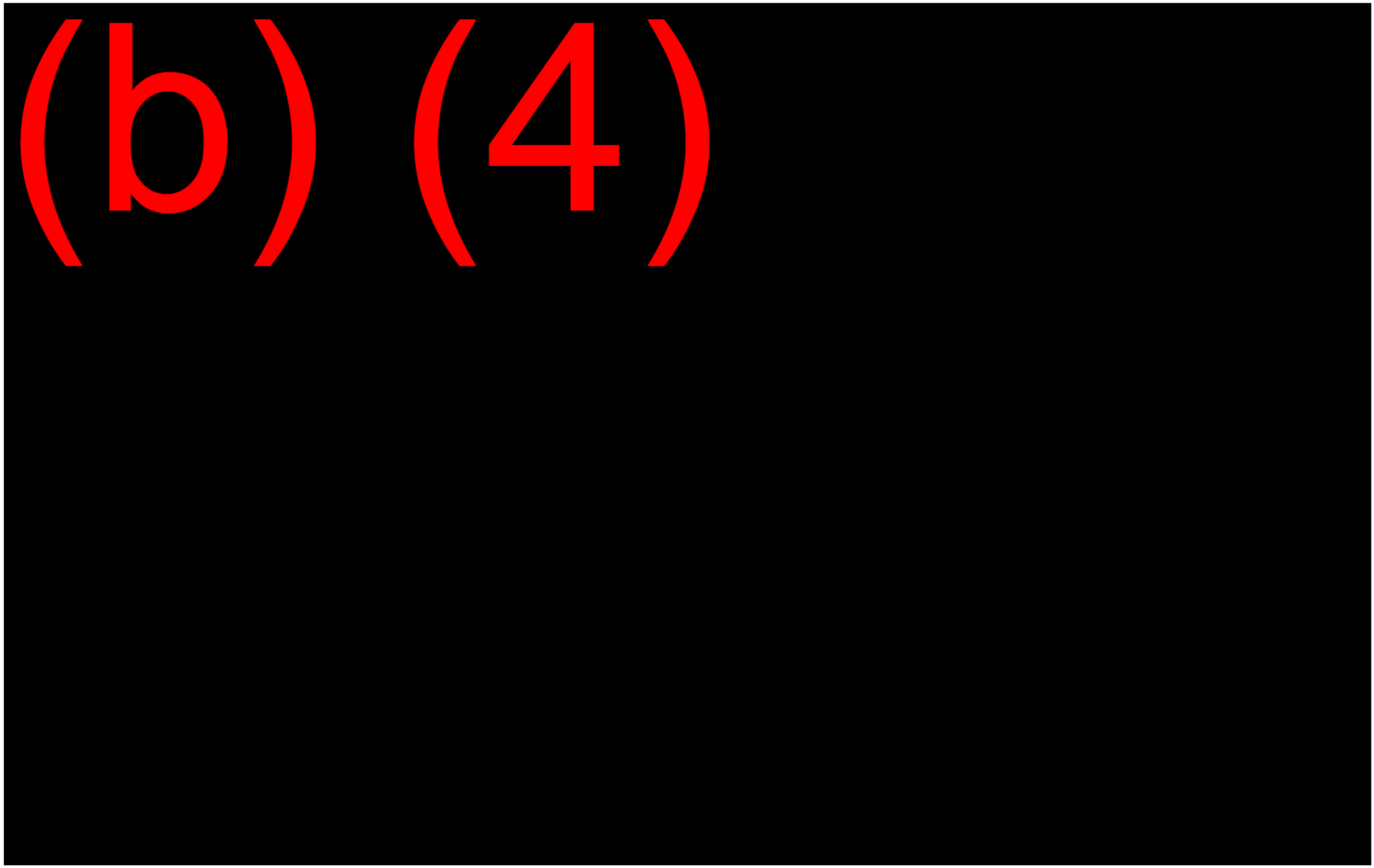
- 5.49 g/kW-hr with DF when tested on 6-mode
- 8.1 g/kW-hr with DF when tested on governor
- Emissions limit for Phase 3, Class II HC + NOx is 8.0 g/kW-hr

(b) (4)

Mode/ Load Point/ Weighing Factor	Standard 6-Mode (ppm)				Governor Test (ppm)			
	Speed	HC	NOx	HC + NOx	Speed	HC	NOx	HC +NOx
1 / (100) / (0.09)	3060	793.99	**417.71**	1211.7	3060	816.11	**379.60**	1195.71
2 / (75) / (0.20)	3060	870.87	**312.72**	1183.59	3485	731.94	**499.42**	1231.36
3 / (50) / (0.29)	3059	790.21	**446.42**	1236.63	3609	147.78	**1310.81**	1458.59
4 / (25) / (0.30)	3061	88.16	**499.61**	587.77	3664	87.23	**786.71**	873.94
5 / (10) / (0.07)	3060	96.65	**228.38**	325.03	3709	51.98	**331.36**	383.34
6 / (Idle) / (0.05)	1885	107.65	**67.08**	174.73	1873	149.60	**65.77**	215.37

Calibration: Emissions

- (b) (4) (FEL = 7.8) (b) (4)
  - Certification Test Data:
    - Certification data on Cycle A
      - » HC + NOx (before DF): 5.72 g/kW-hr
    - 12/30/2015 test on Cycle B
      - » HC + NOx (before DF): 7.54 g/kW-hr
    - 32 percent difference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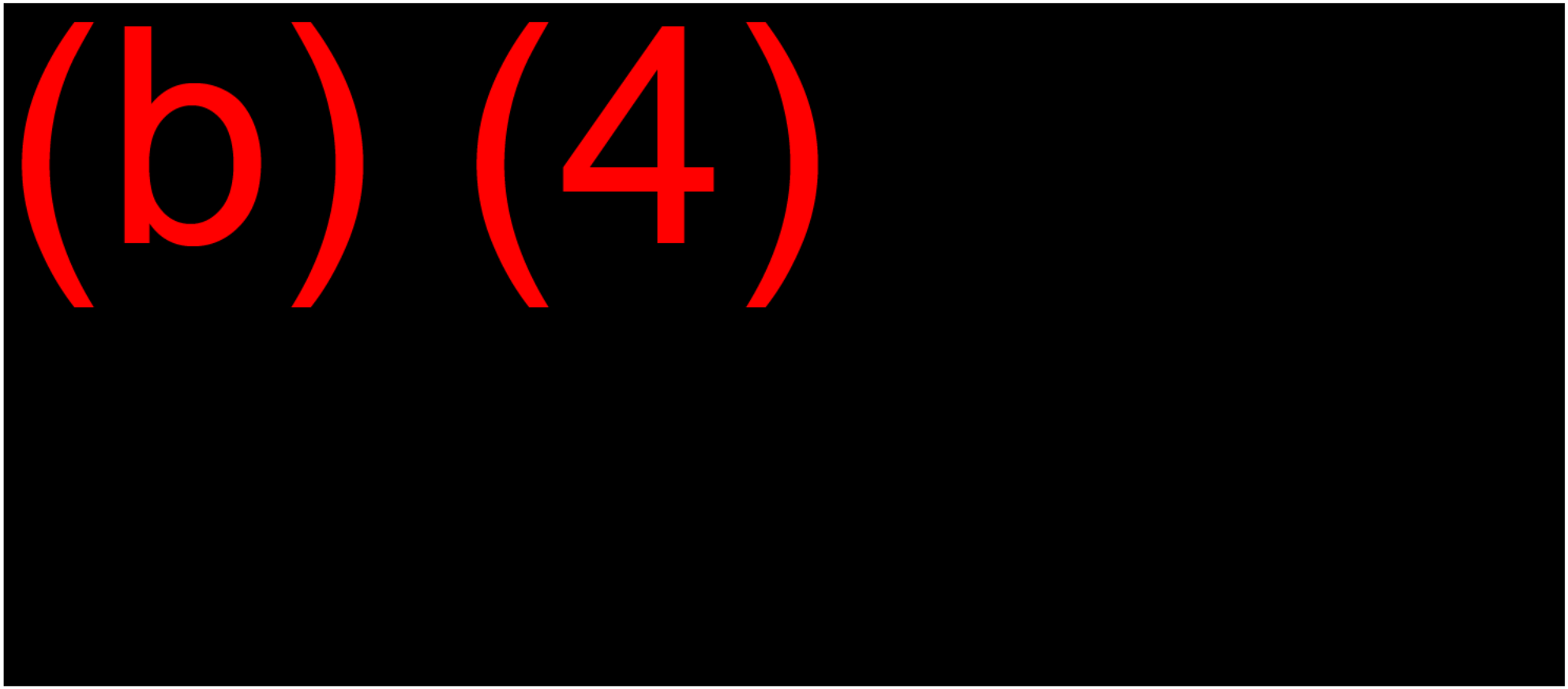
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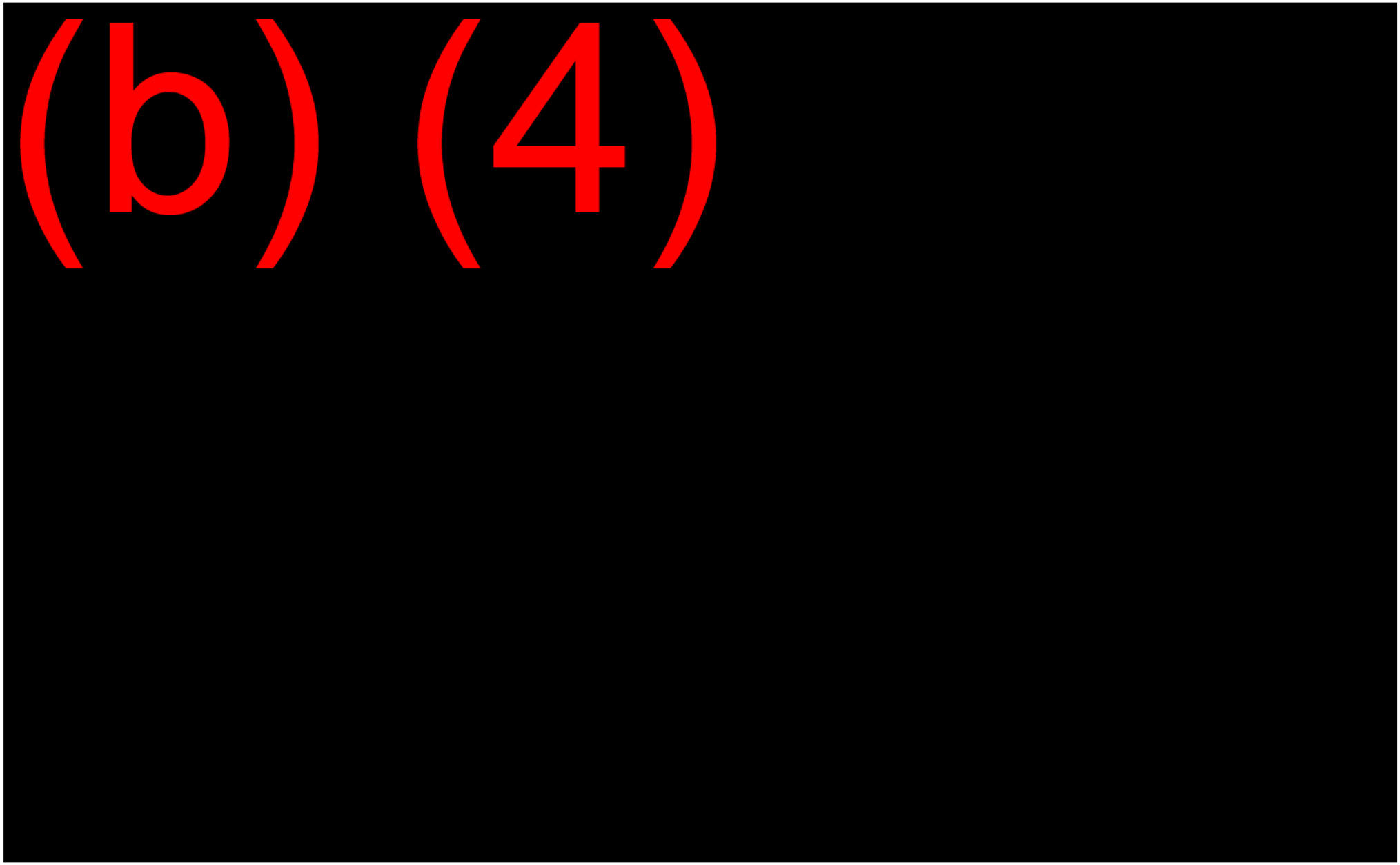
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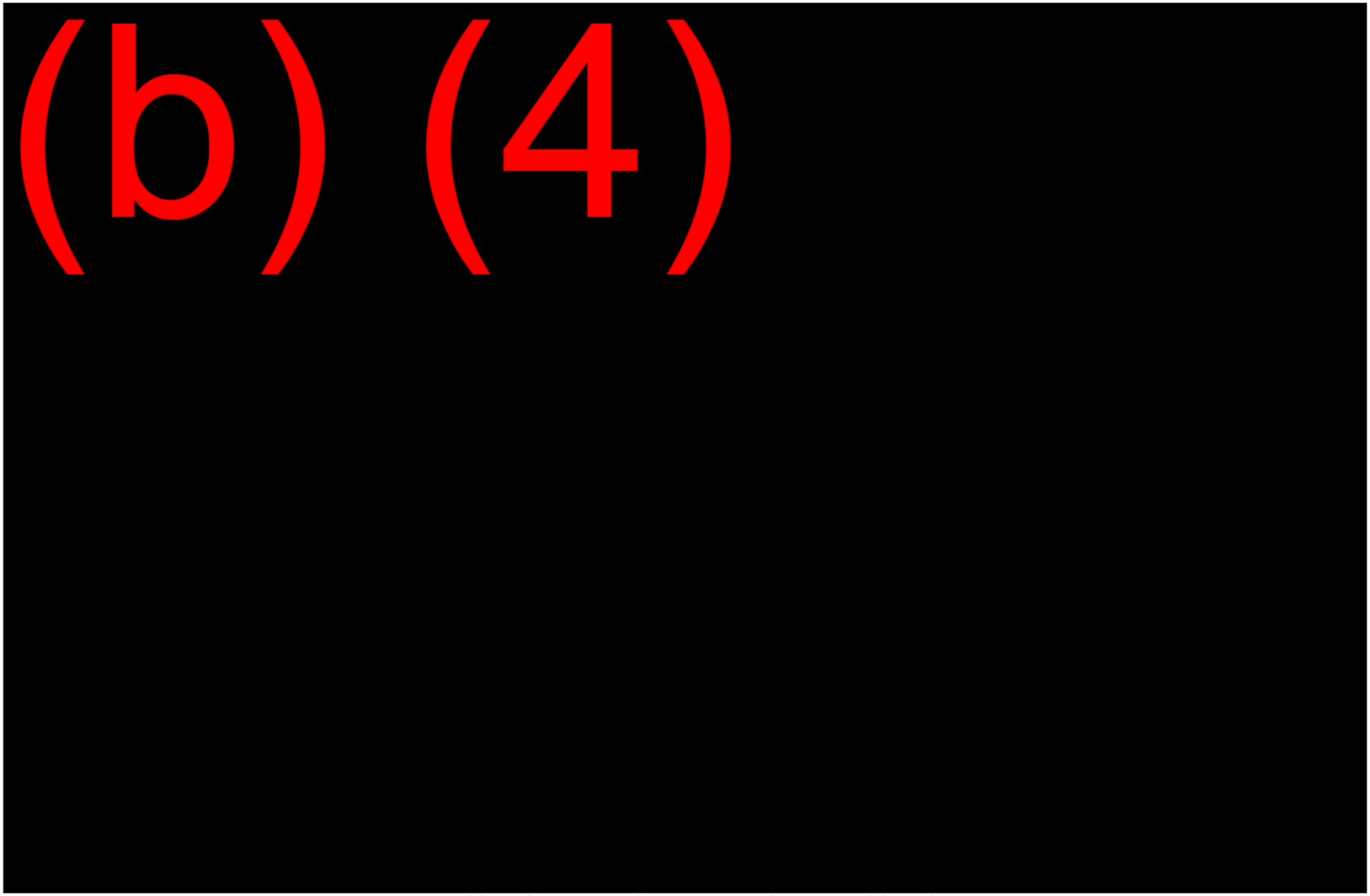
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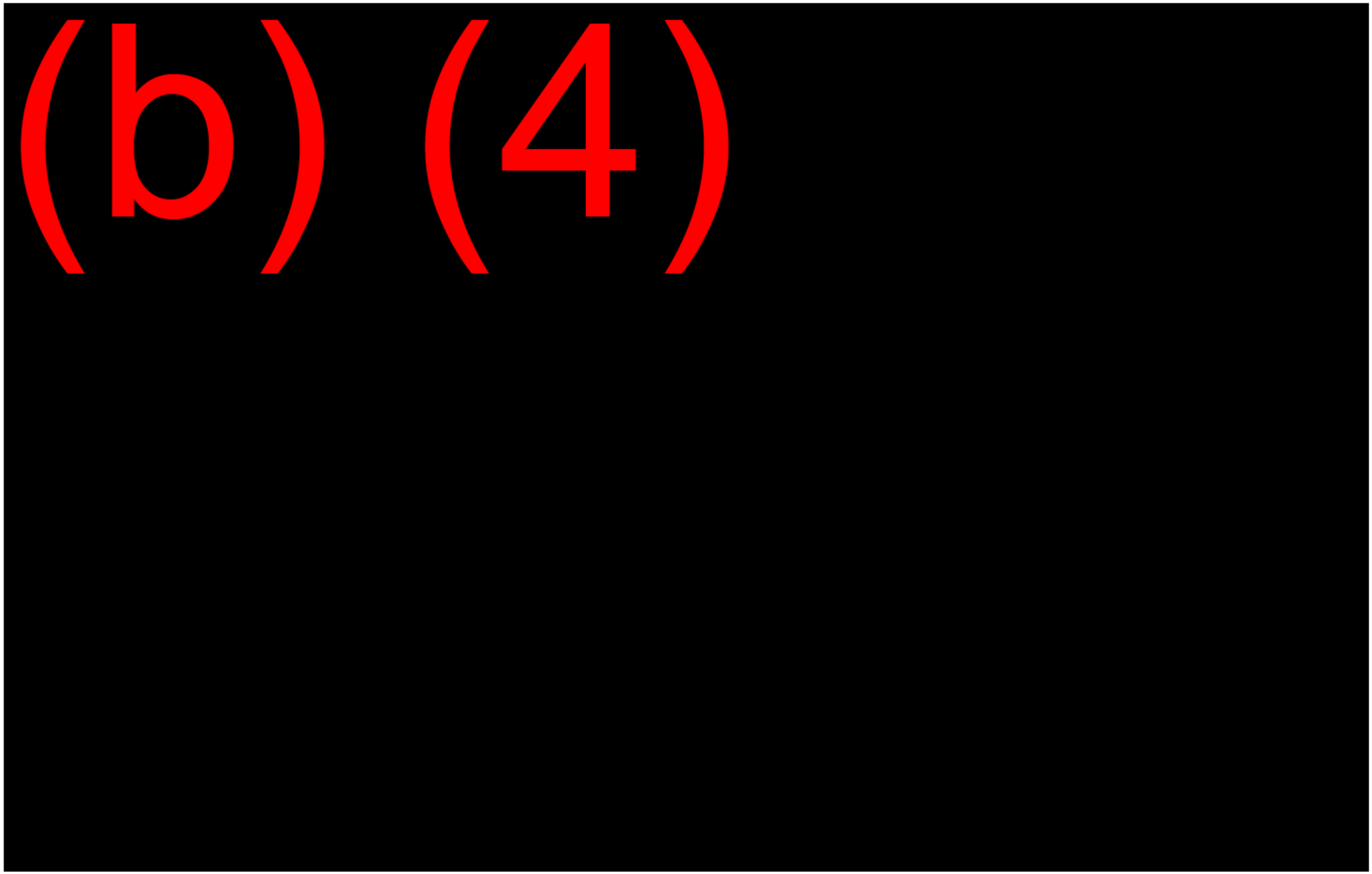
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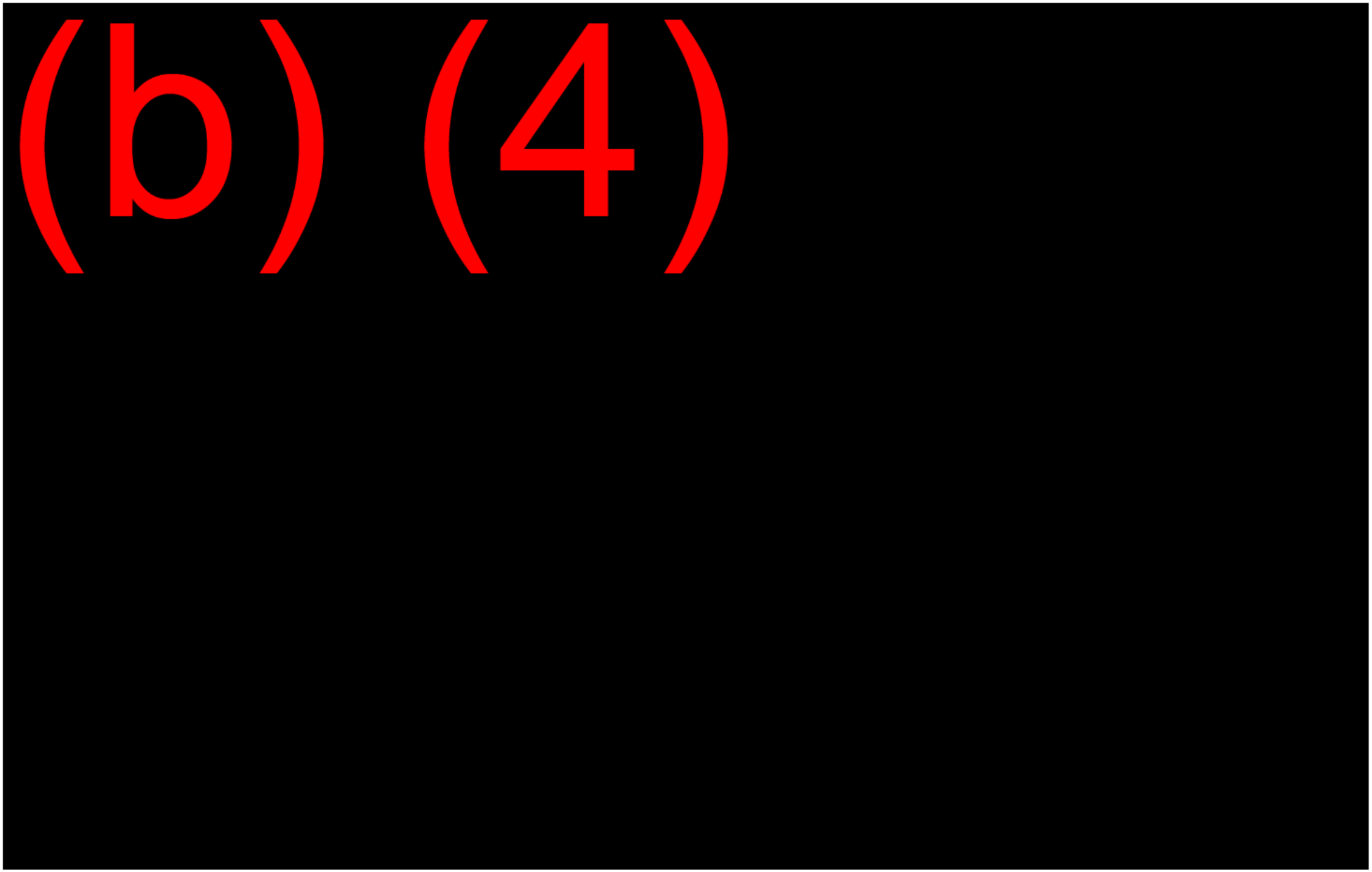
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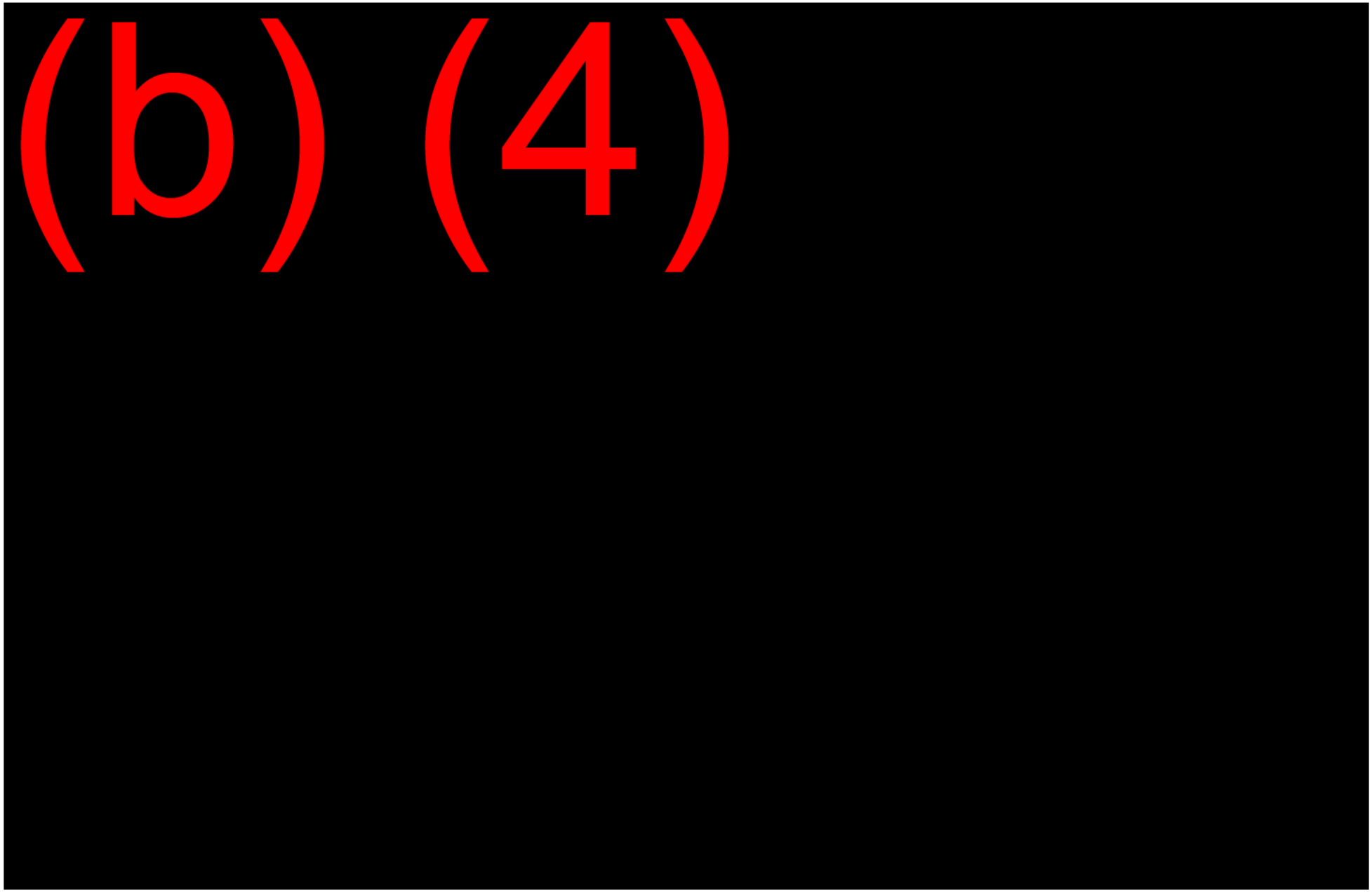
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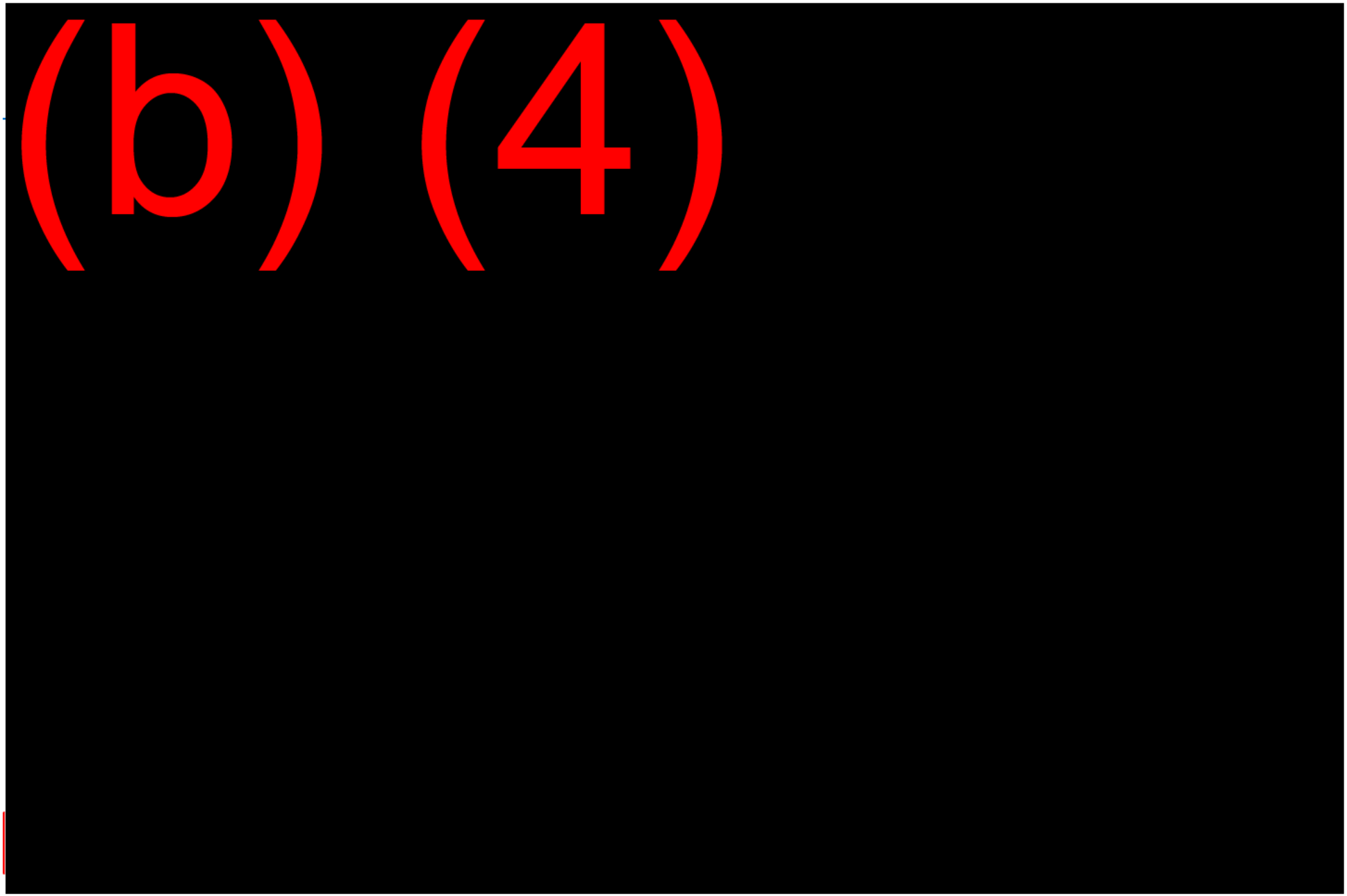
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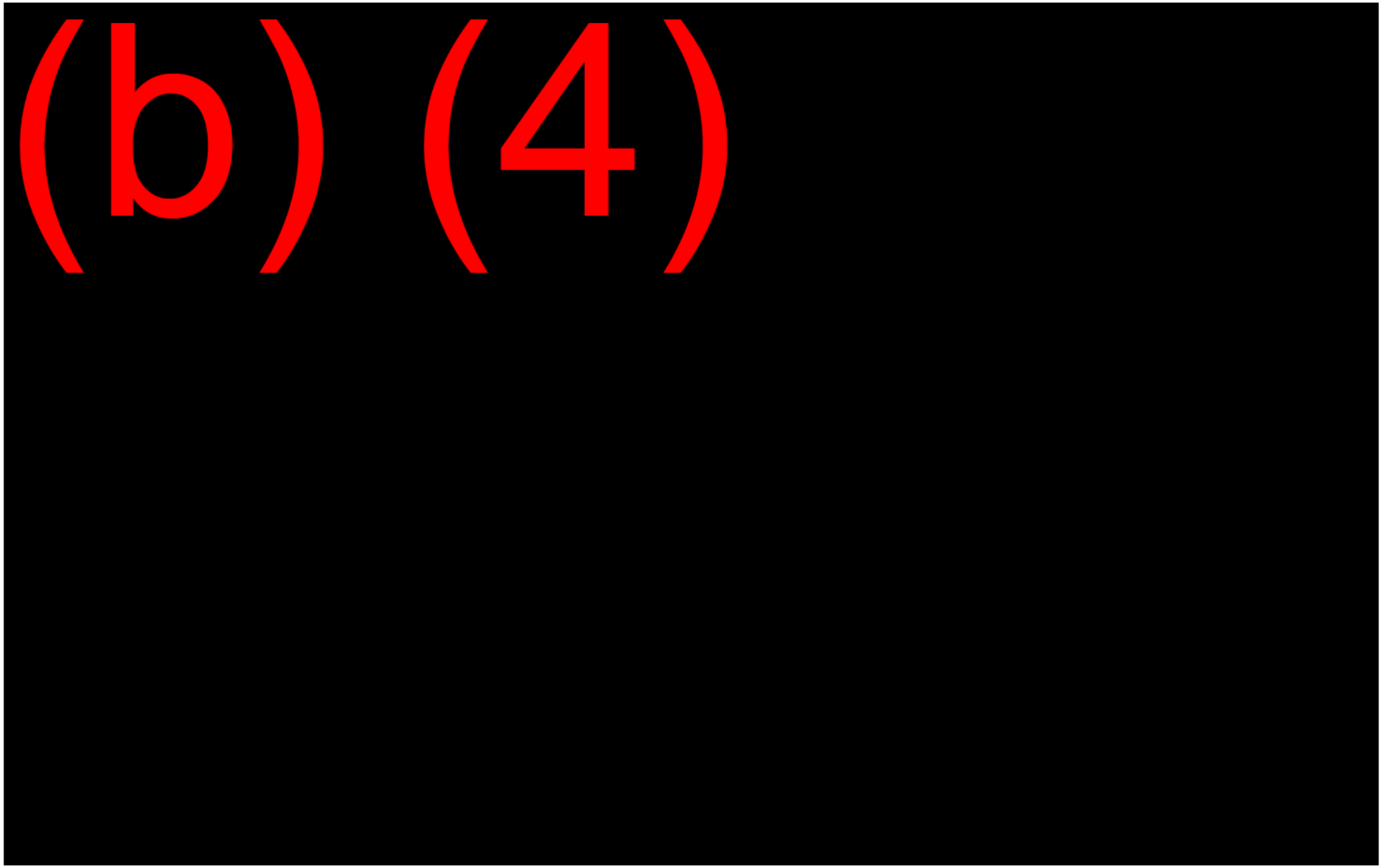
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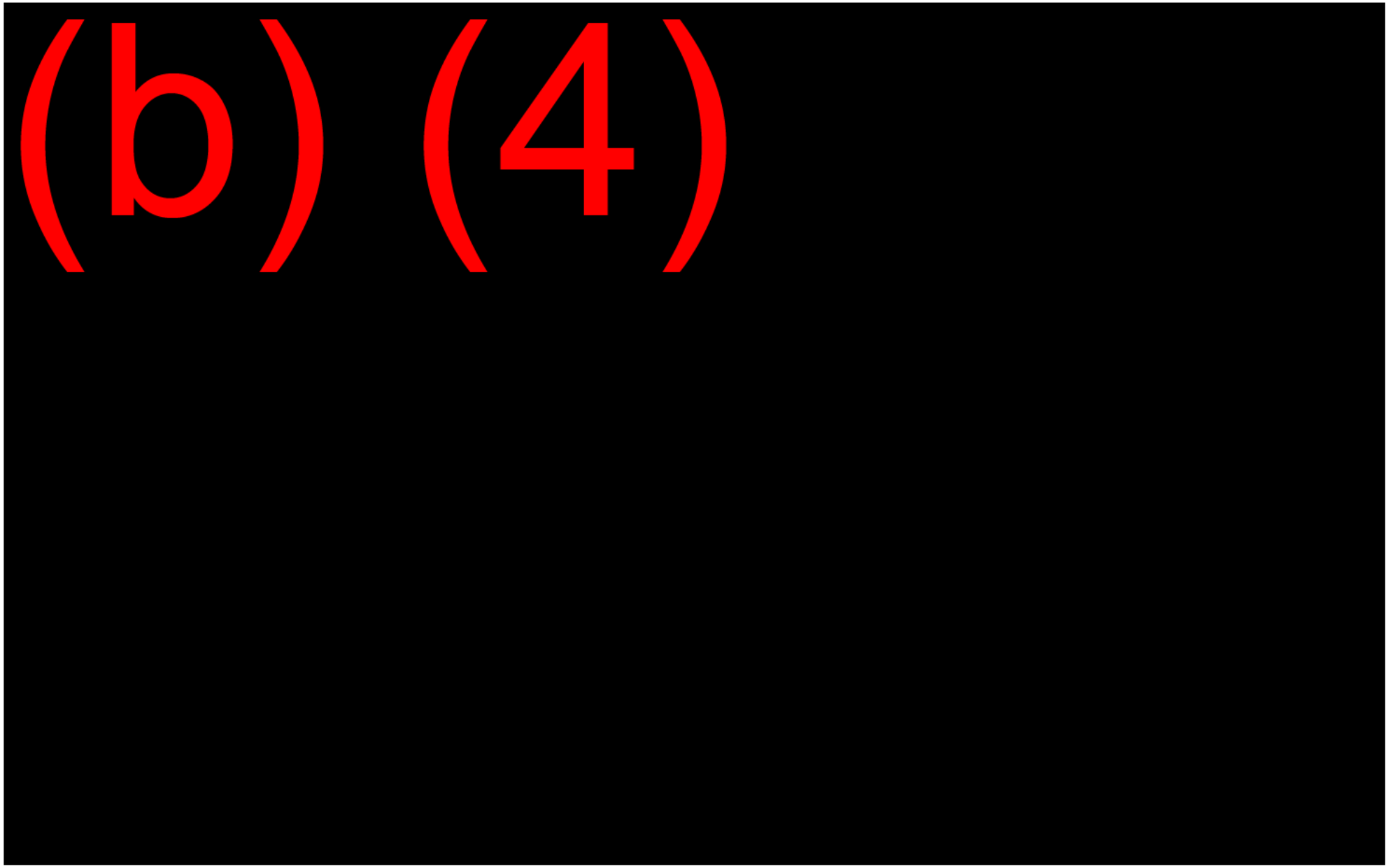
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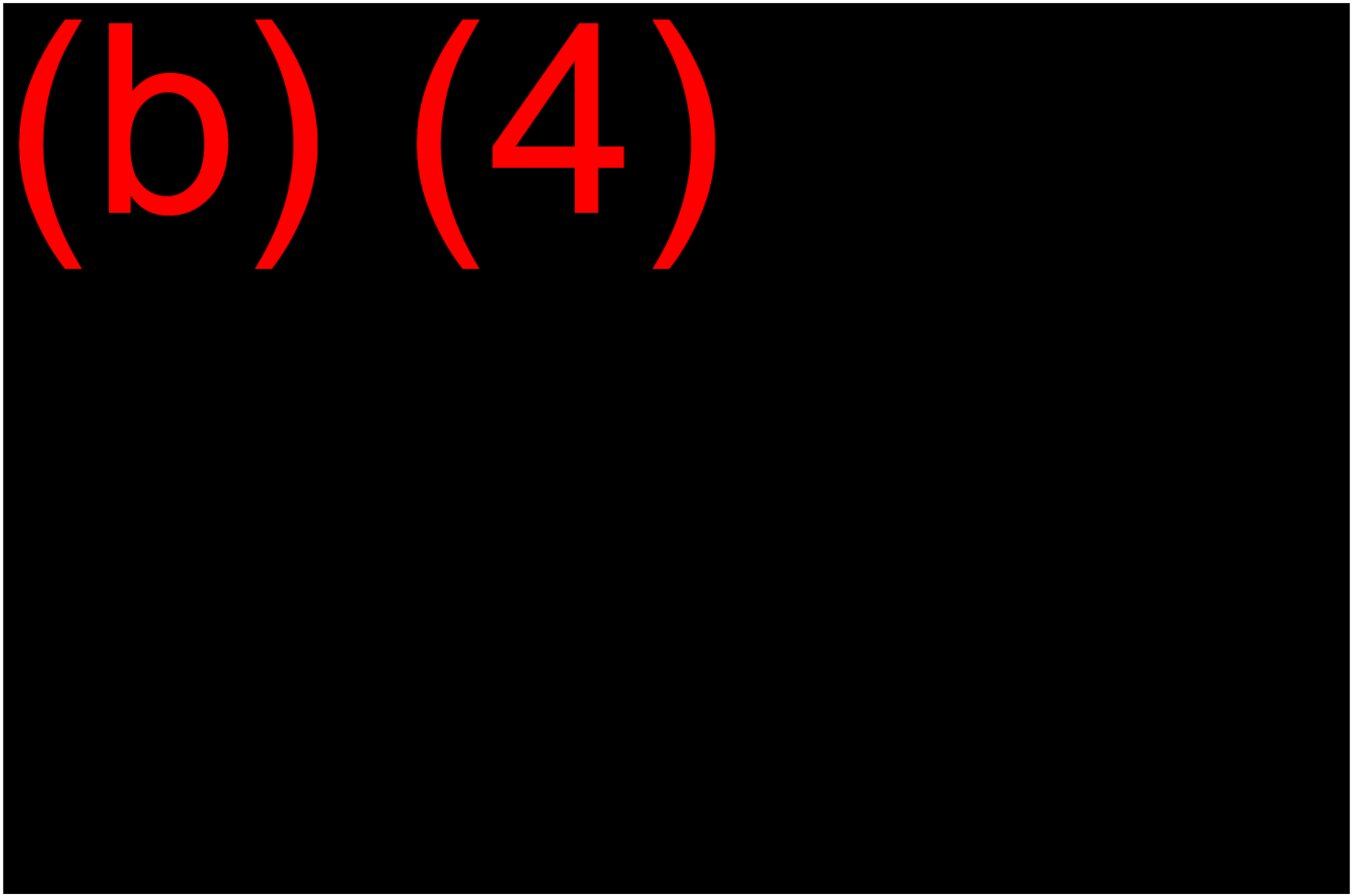
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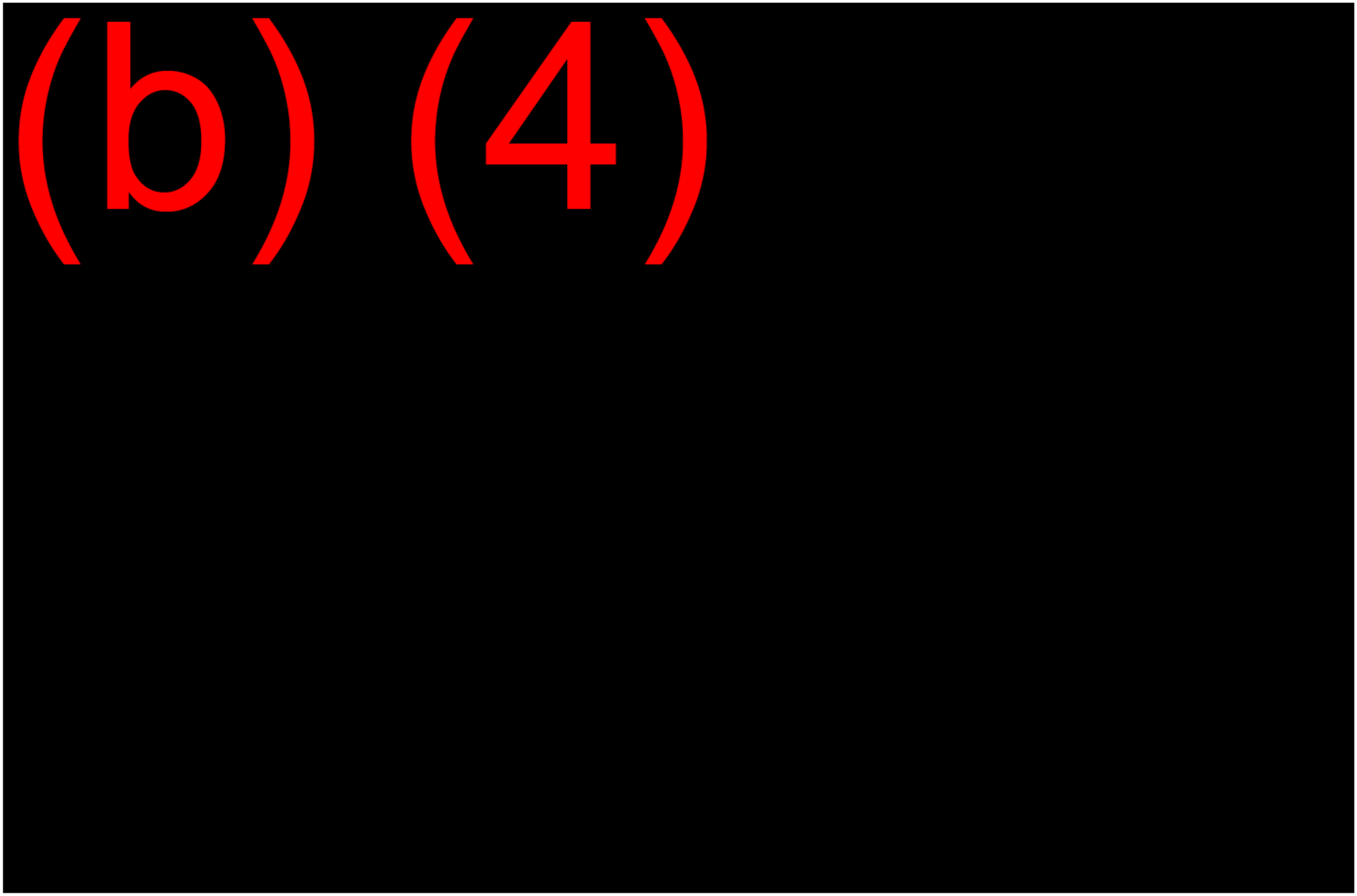
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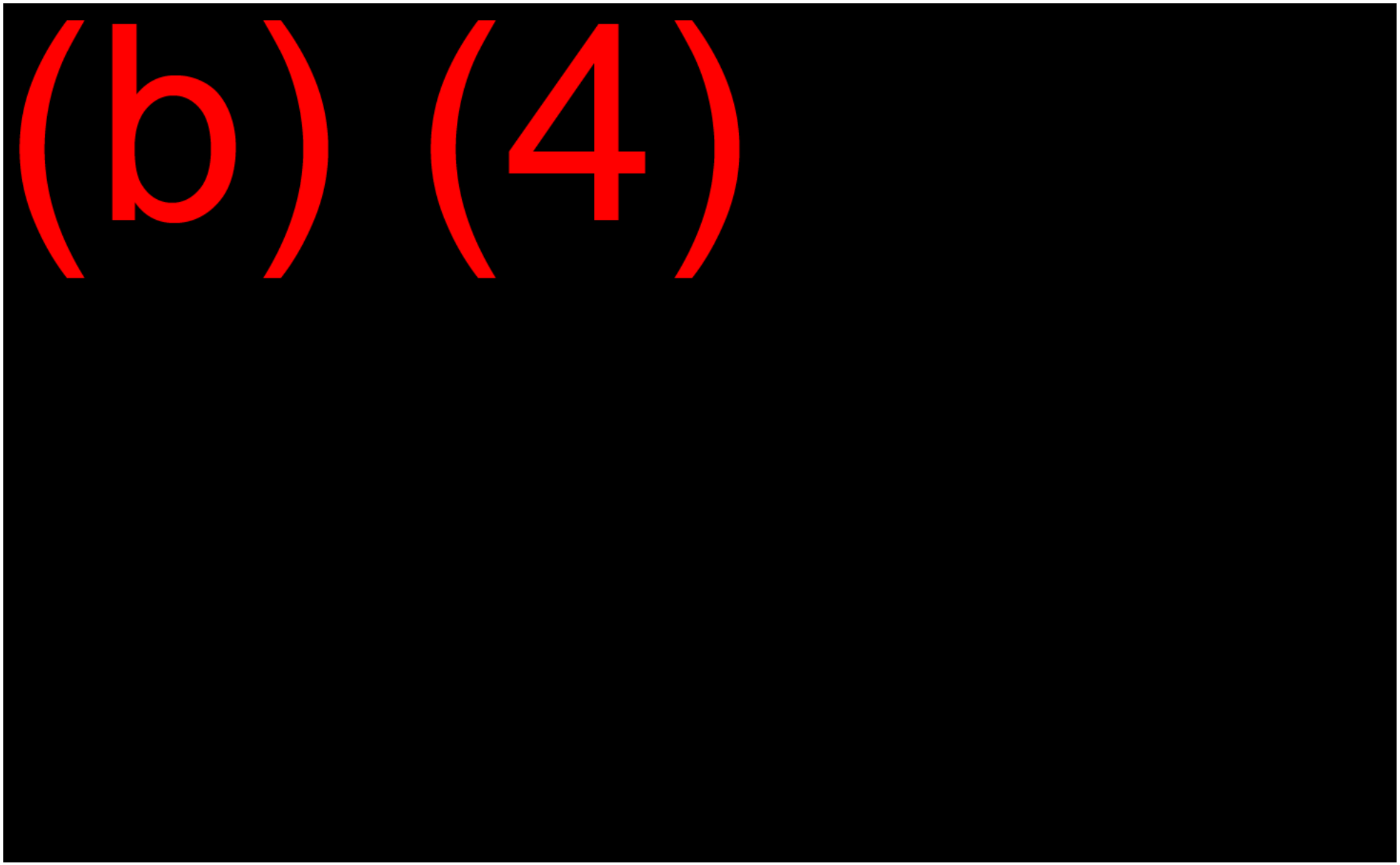
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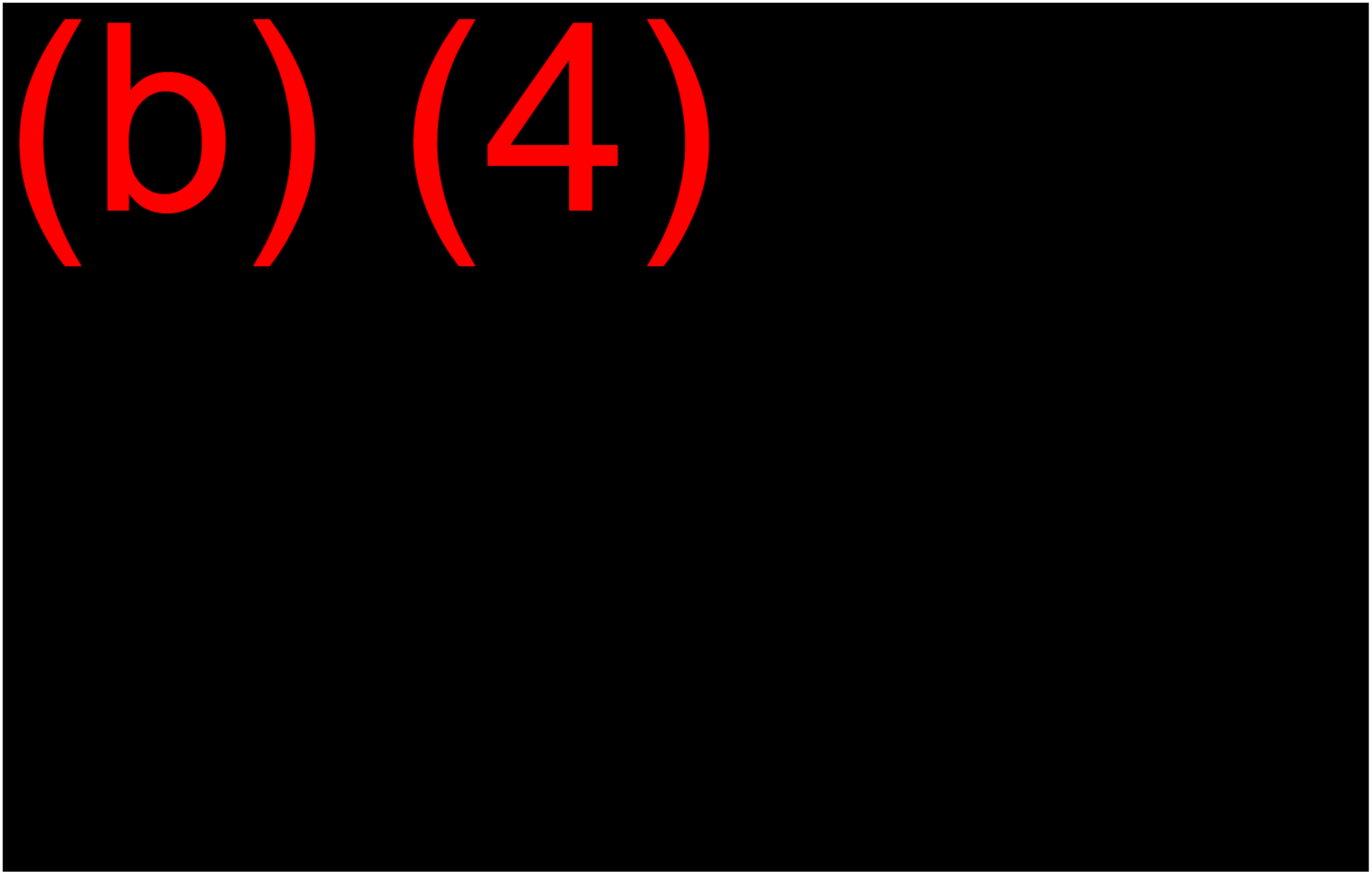
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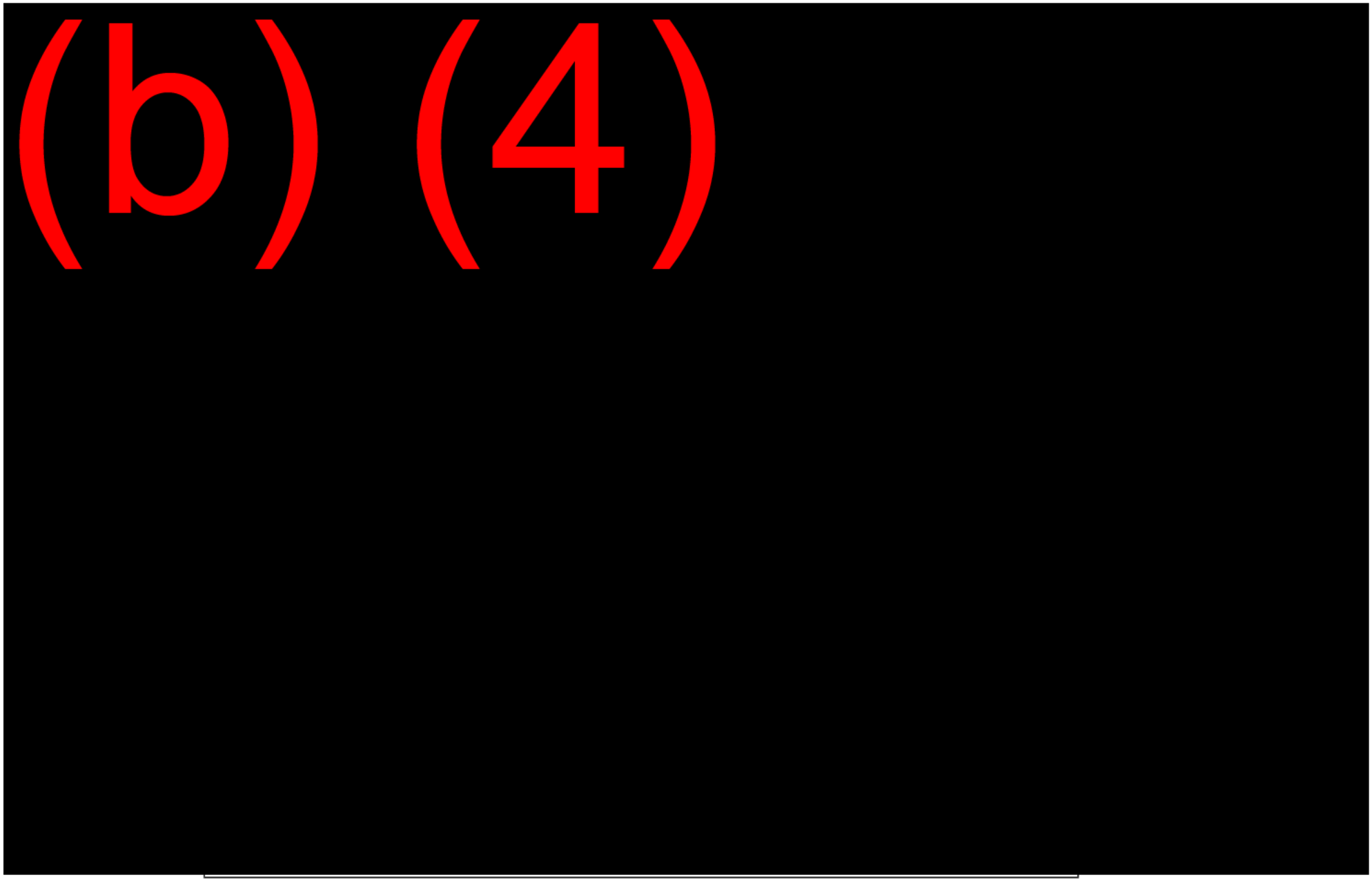
(b) (4)

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(b) (4)

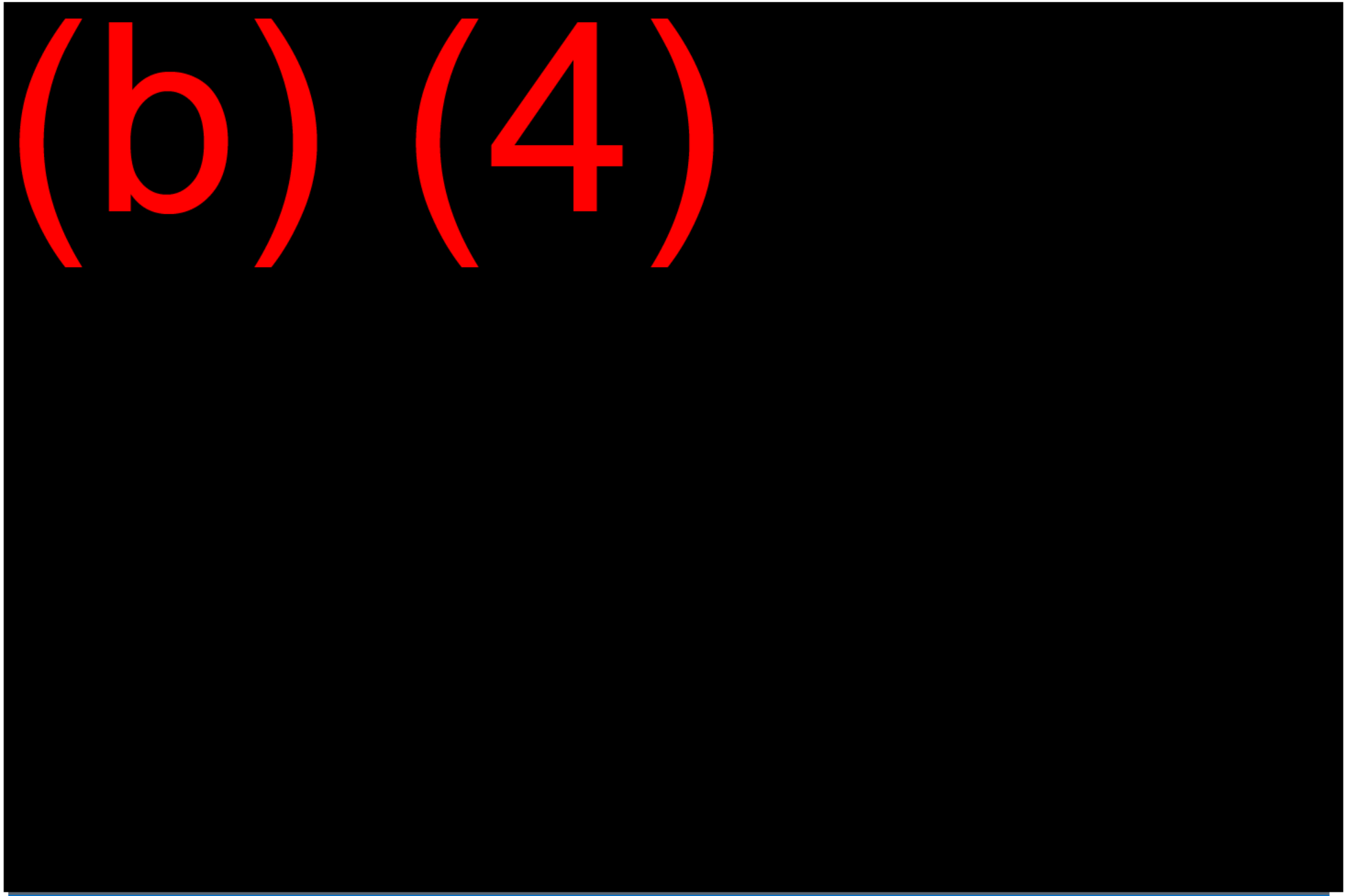
Part 90.119 (Certification Procedure – Testing)
(i) Class I and II engines must use the test cycle that is appropriate for their application. Engines that operate only at intermediate speed must use Test Cycle A, which is described in Table 2 of Appendix A to subpart E of this part. Engines that operate only at rated speed must use Test Cycle B, which is described in Table 2 of Appendix A to subpart E of this part. If an engine family includes engines used in both rated-speed and intermediate-speed applications, the manufacturer must select the duty cycle that will result in worst-case emission results for certification. For any testing after certification, the engine must be tested using the most appropriate test cycle based on the engine's installed governor.

"If an engine family includes engines used in both rated-speed and intermediate-speed applications, the manufacturer must select the duty cycle that will result in worst-case emission results for certification."

(b) (4)

(b) (4)

(b) (4)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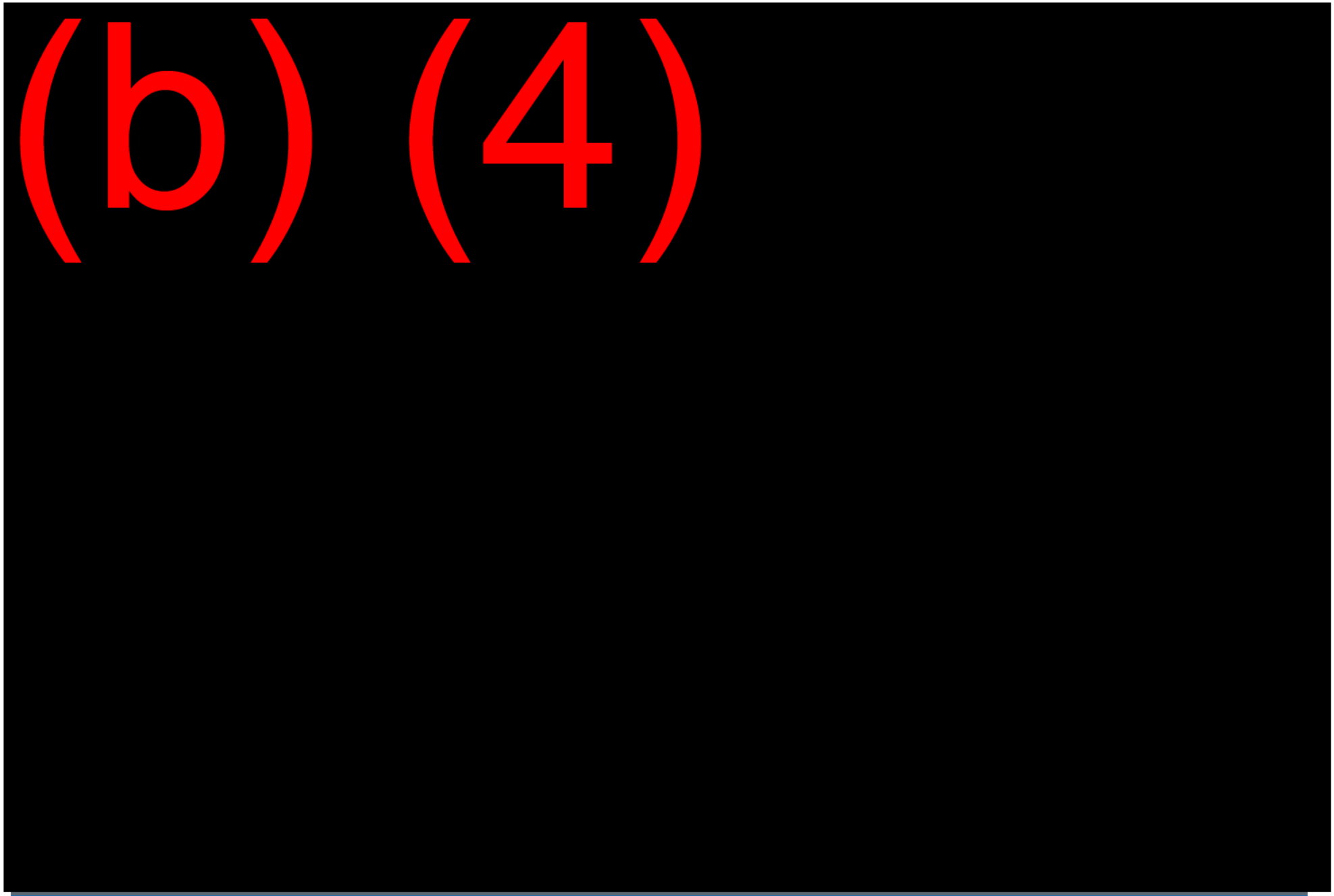
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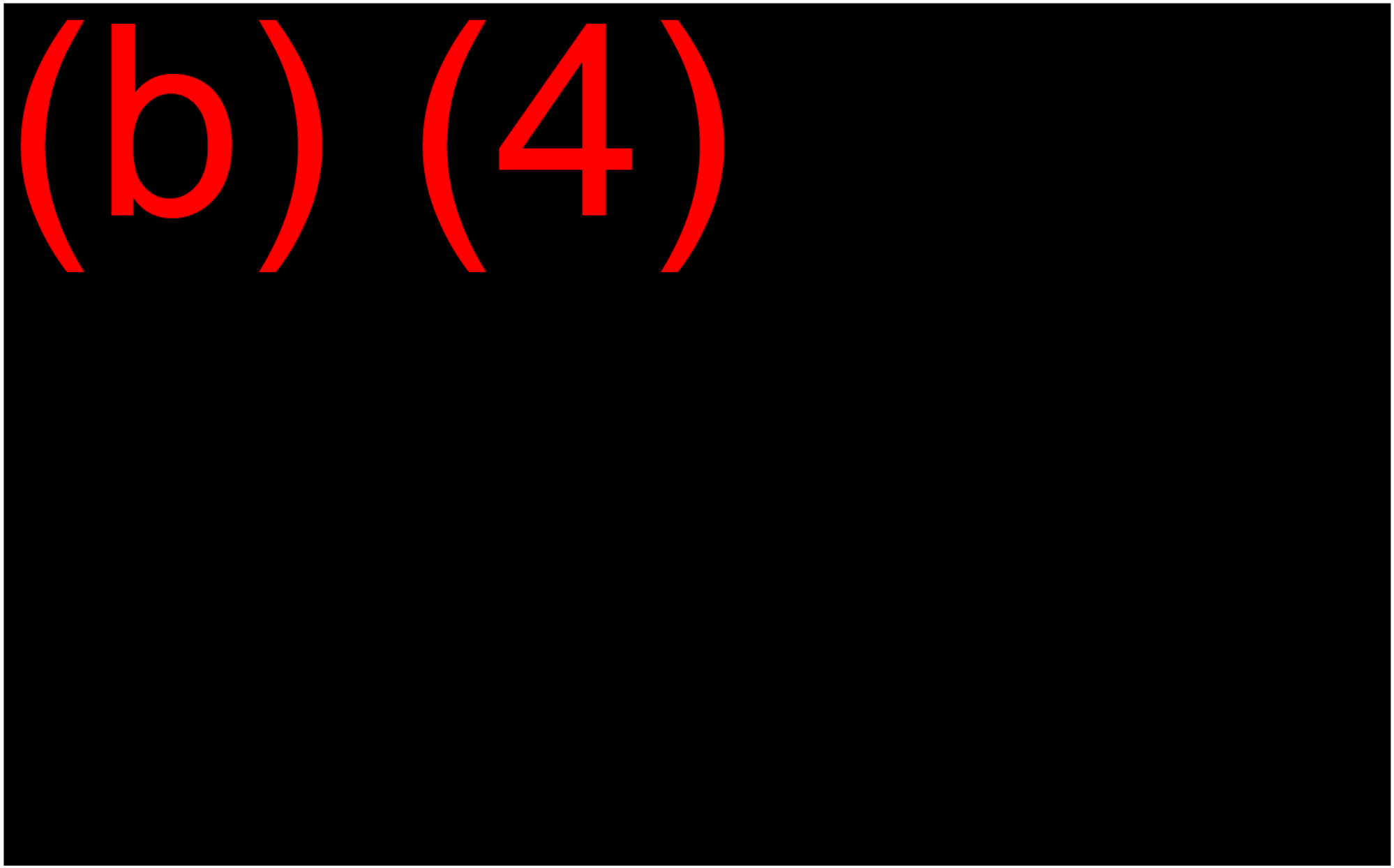
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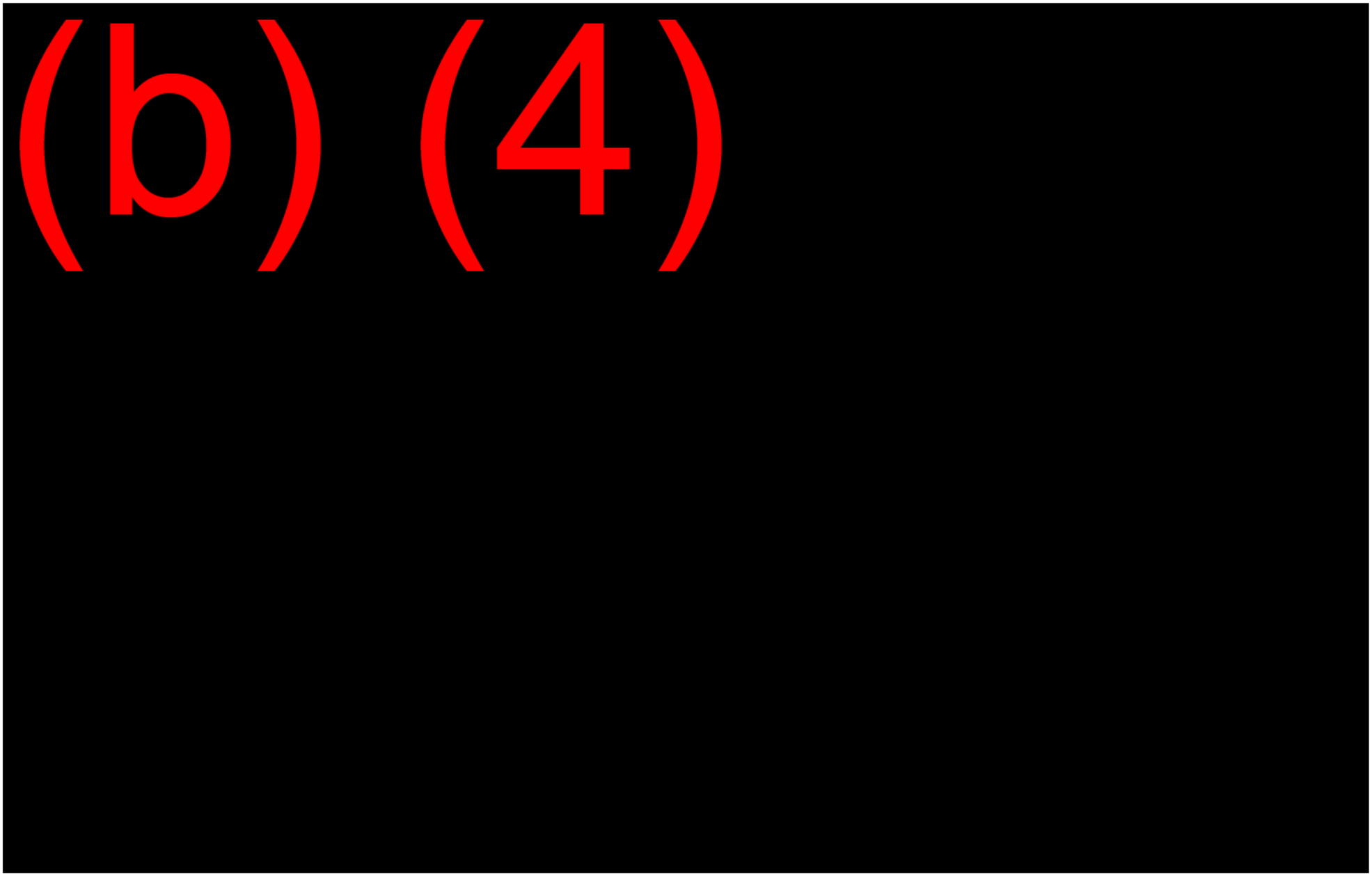
(b) (4) [redacted]

- Regulatory Environment
  - Part 90 rules in effect until 2011
    - (b) (4) [redacted]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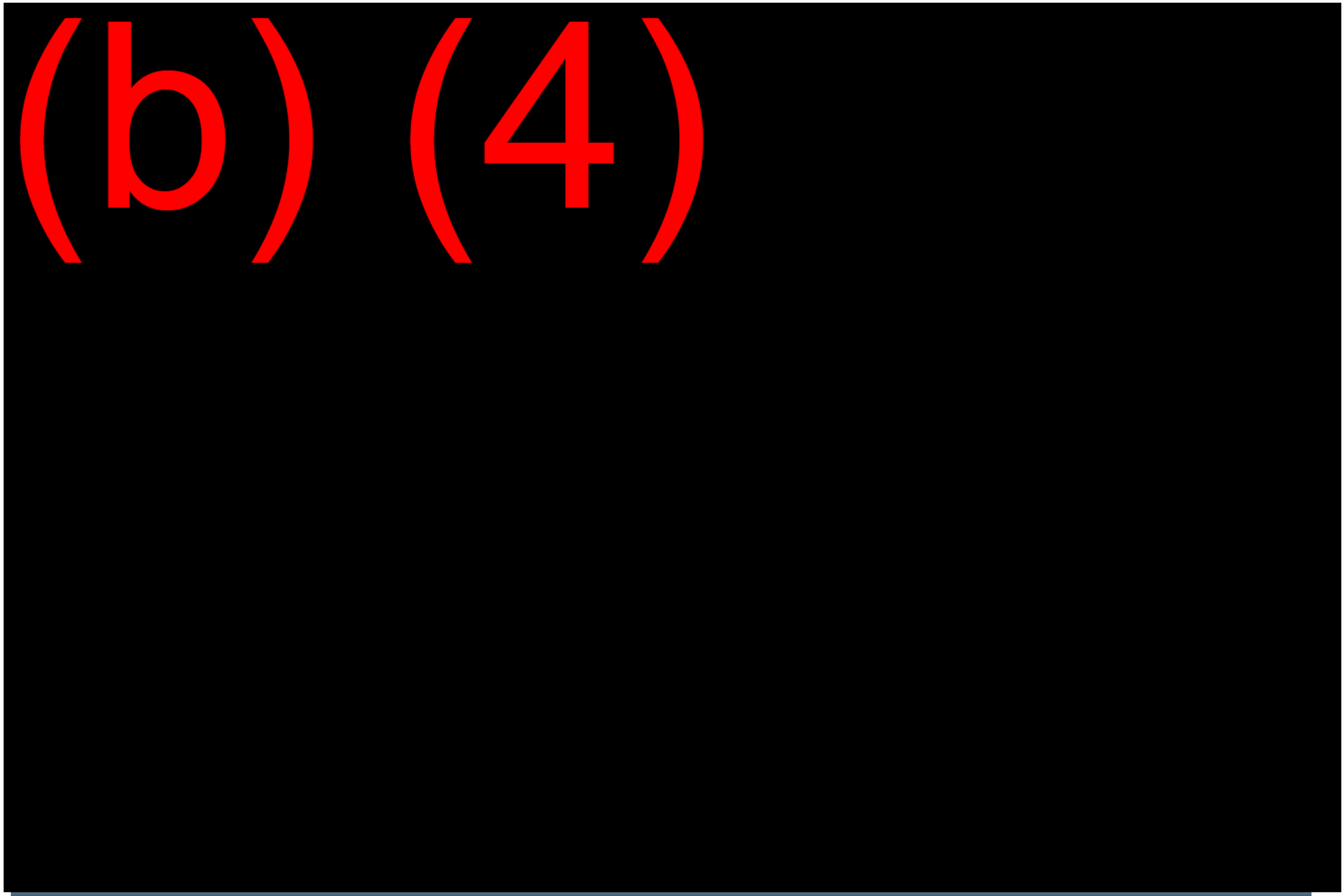
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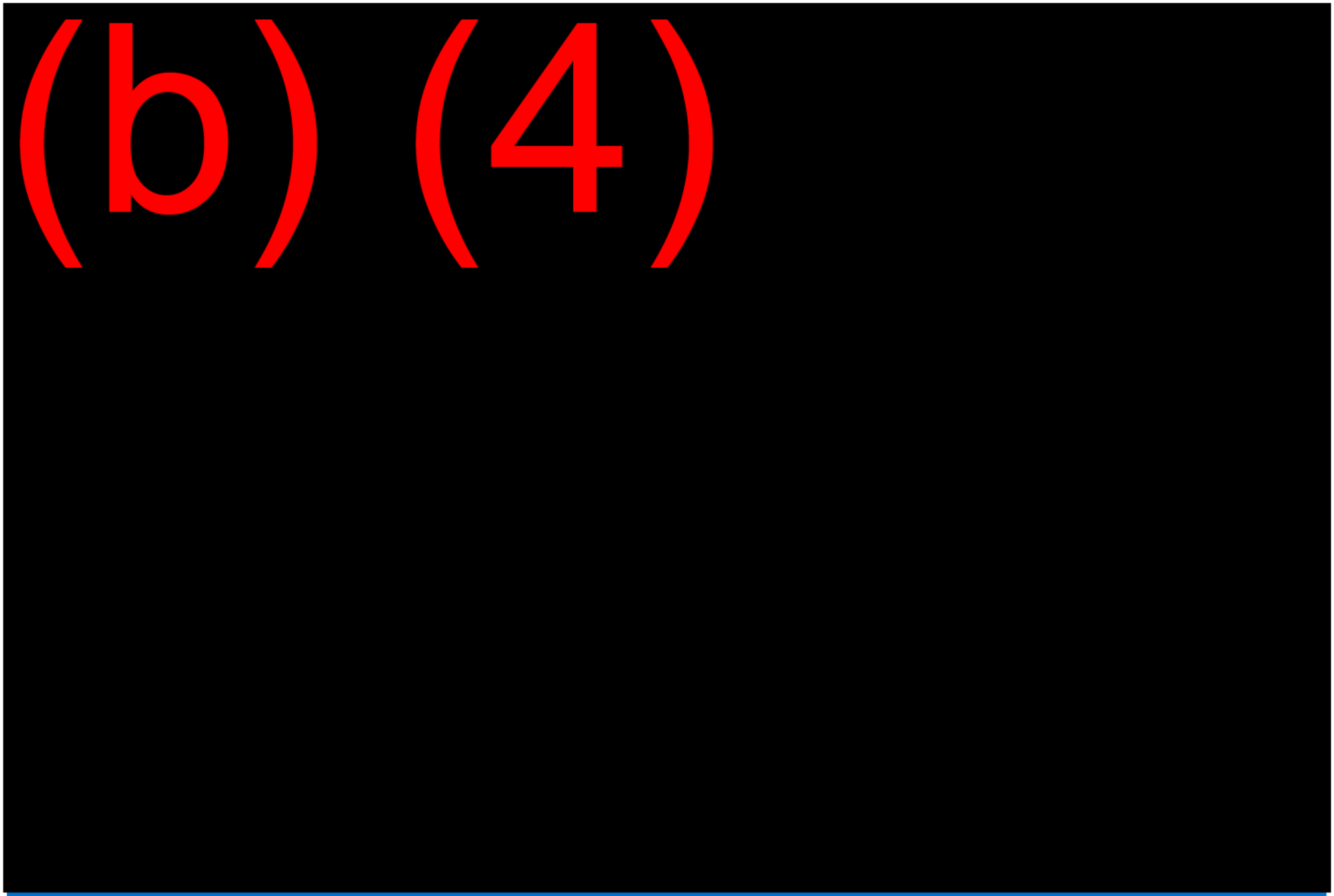
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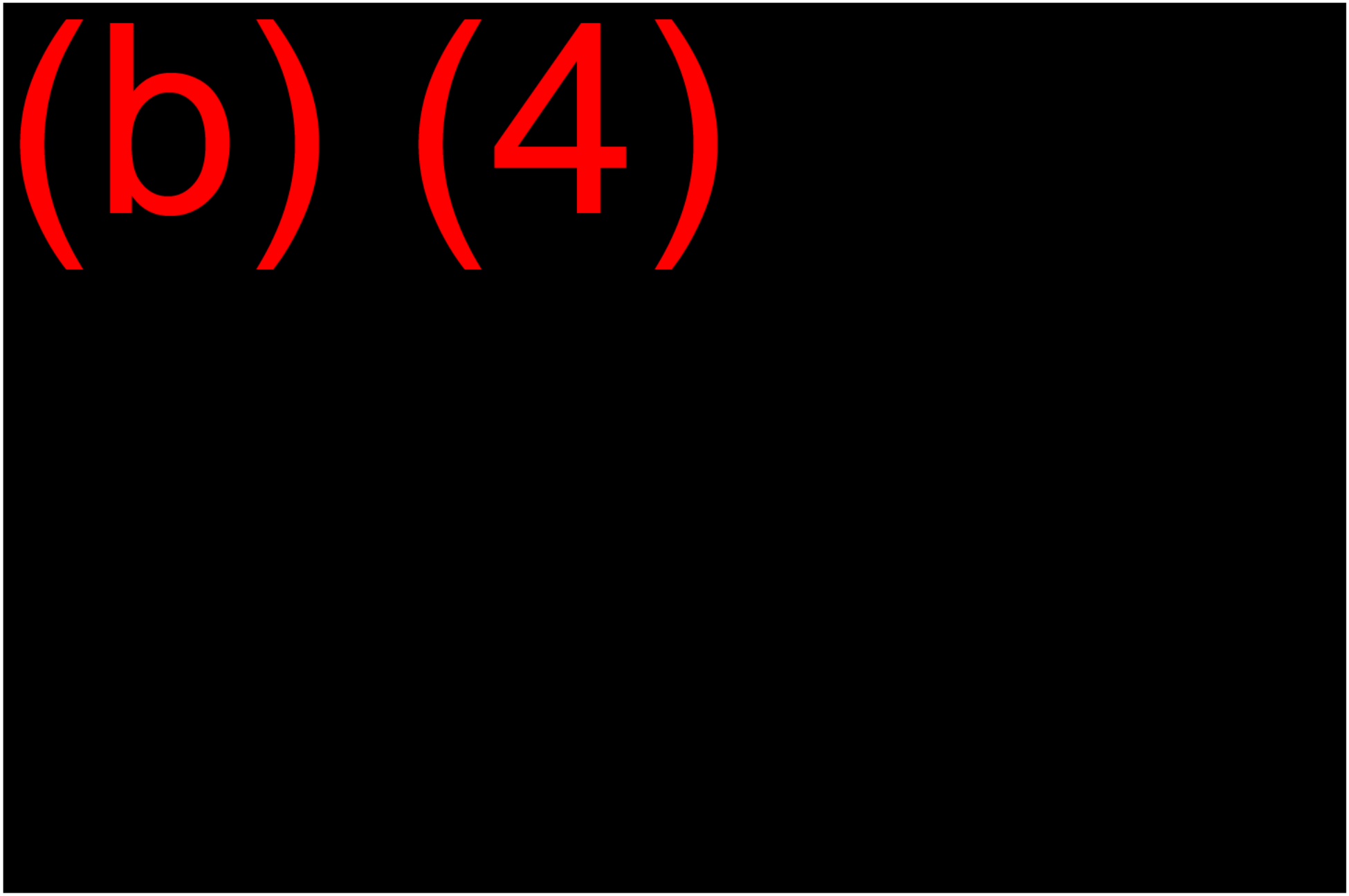
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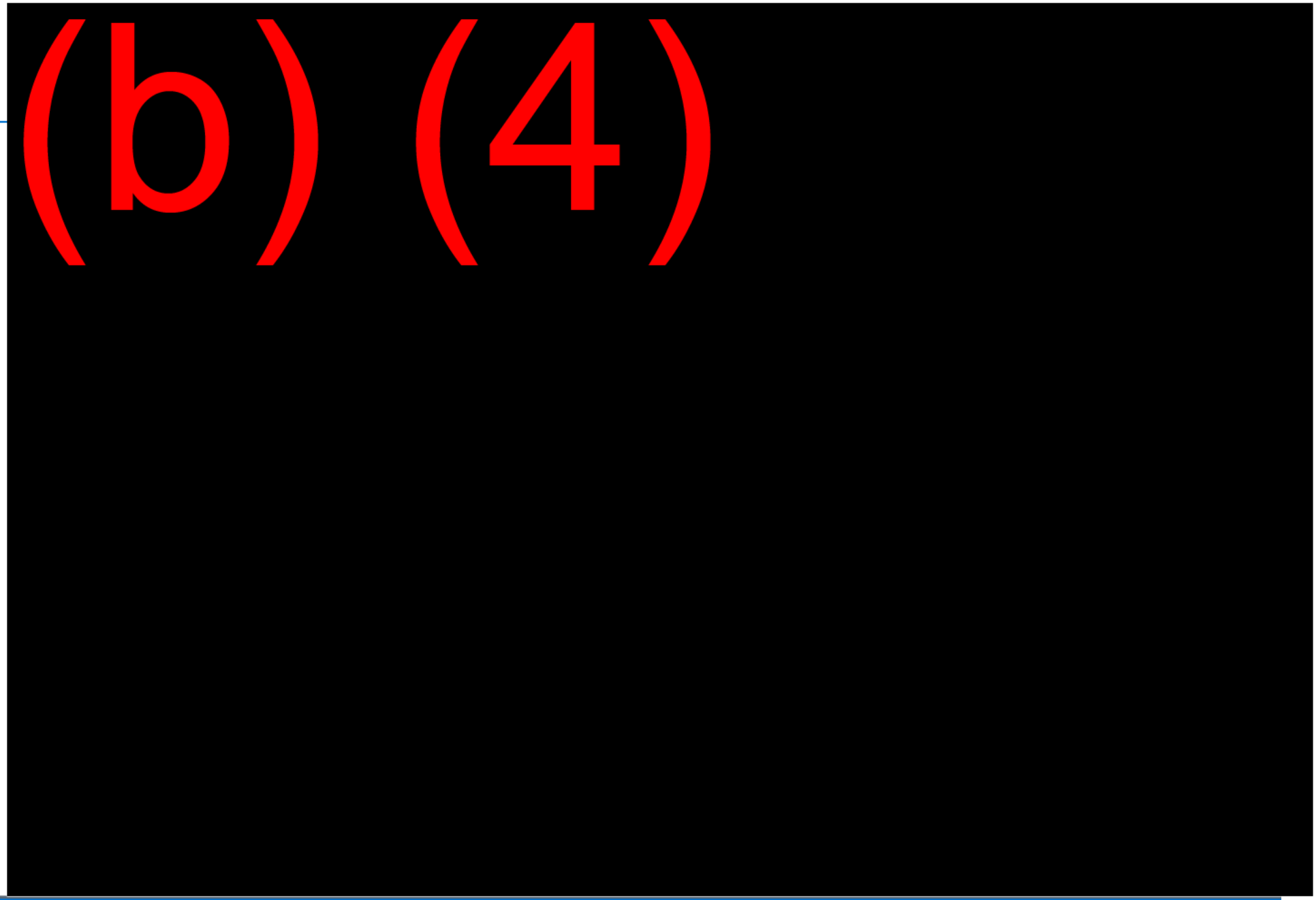
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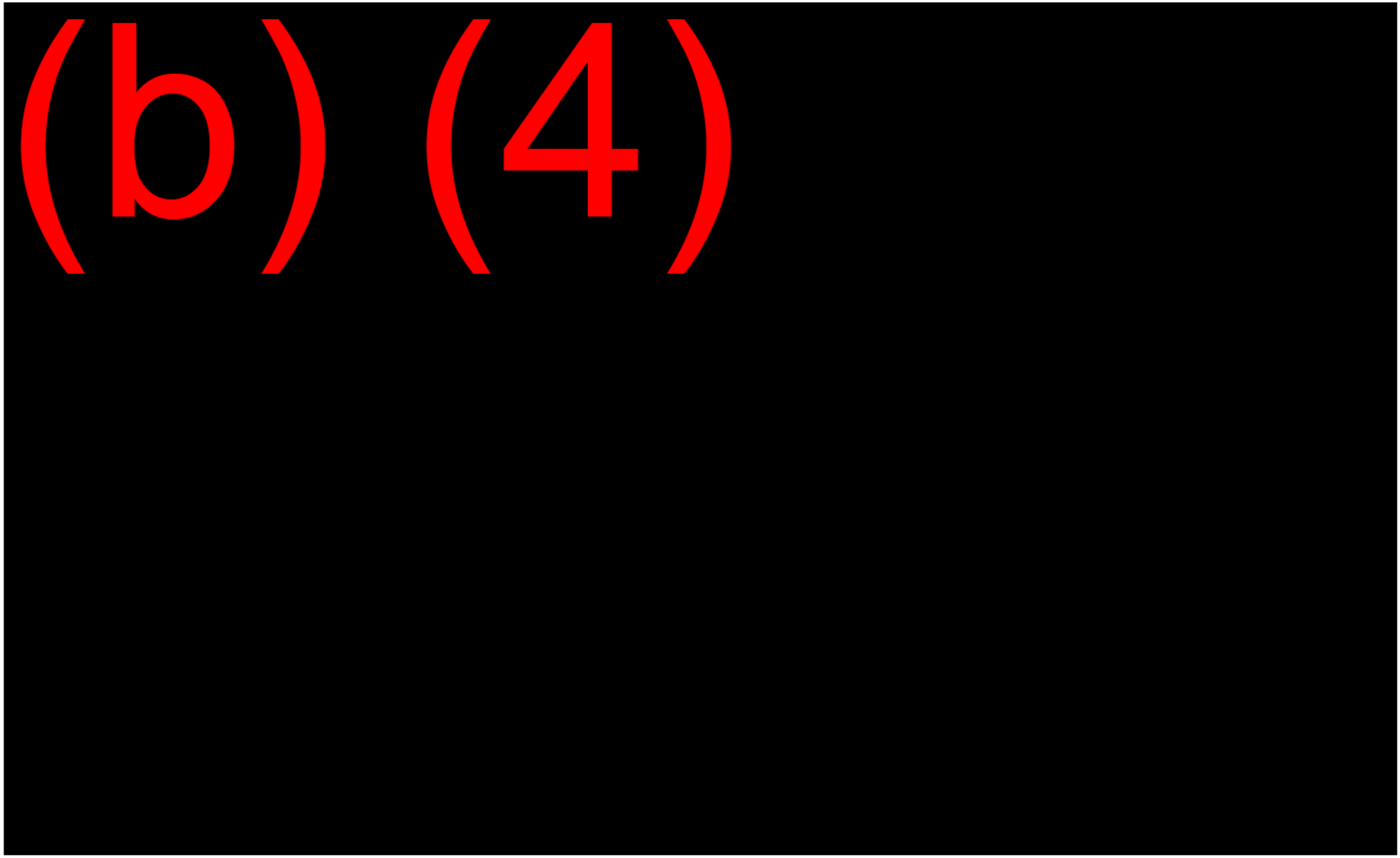
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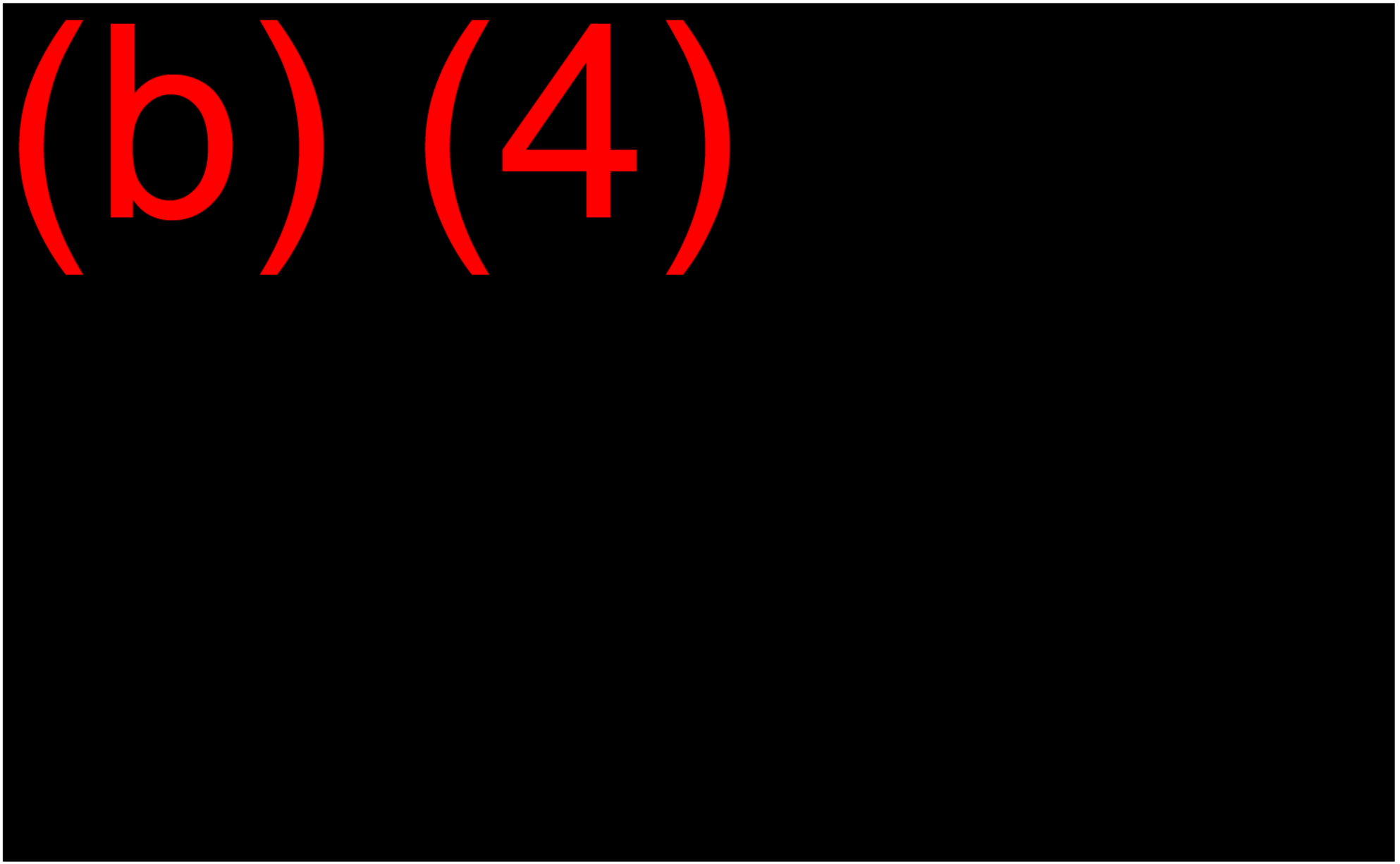

(b) (4)

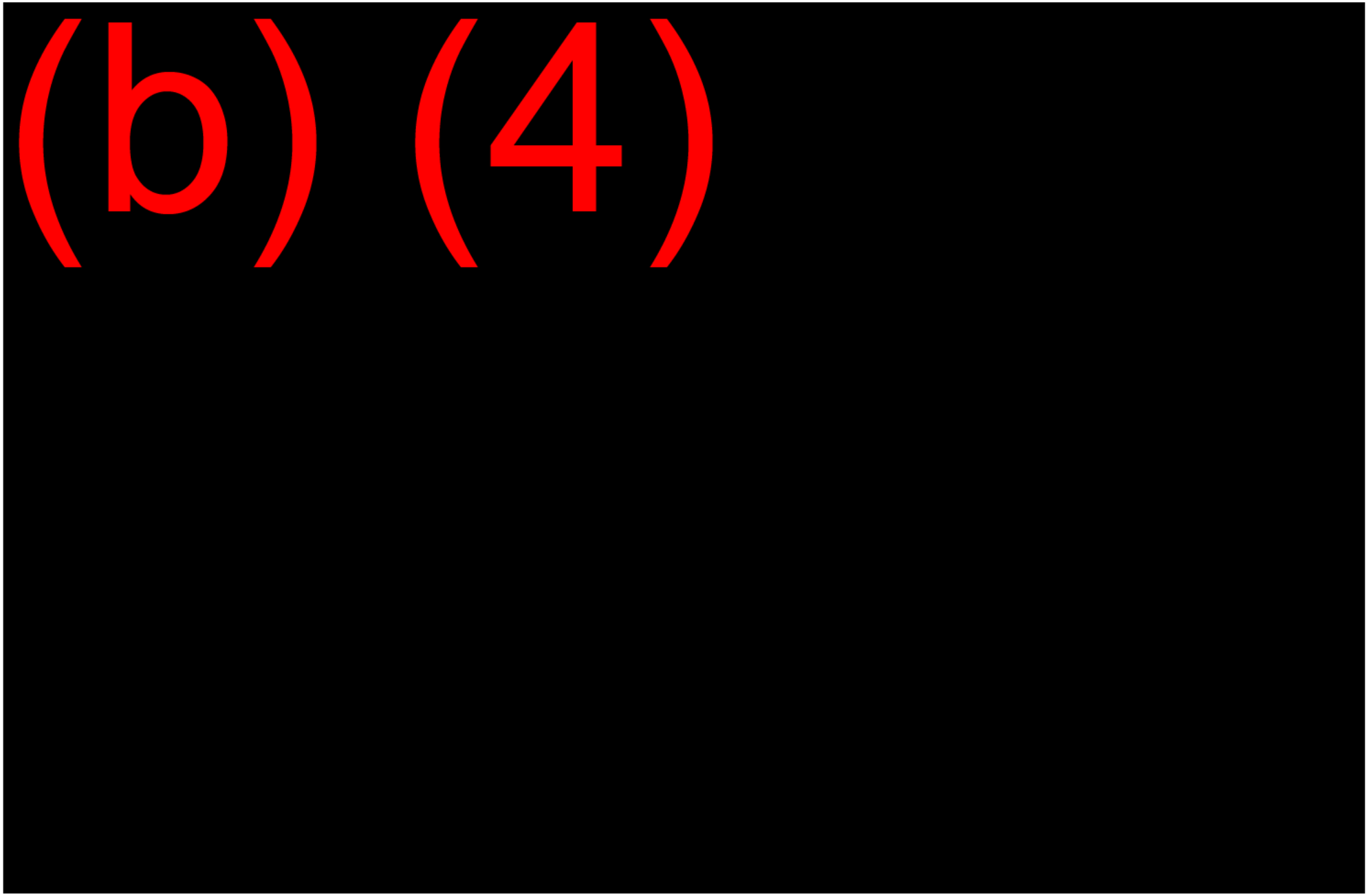
(b) (4)

(b) (4)

Per 40 CFR Part 1068.110 (d): *Defeat devices*. We may test engines and equipment to investigate potential defeat devices. We may also require the manufacturer to do this testing. If we choose to investigate one of your designs, we may require you to show us that it does not have a defeat device. To do this, you may have to share with us information regarding test programs, engineering evaluations, design specifications, calibrations, on-board computer algorithms, and design strategies. It is a violation of the Clean Air Act for anyone to make, install or use defeat devices. See §1068.101(b)(2) and the standard-setting part.

The referenced 40 CFR Part 1068.101(b)(2): *Defeat devices*. You may not knowingly manufacture, sell, offer to sell, or install, any part that bypasses, impairs, defeats, or disables the control of emissions of any regulated pollutant, except as explicitly allowed by the standard-setting part. We may assess a civil penalty up to $3,750 for each part in violation.

(b) (4)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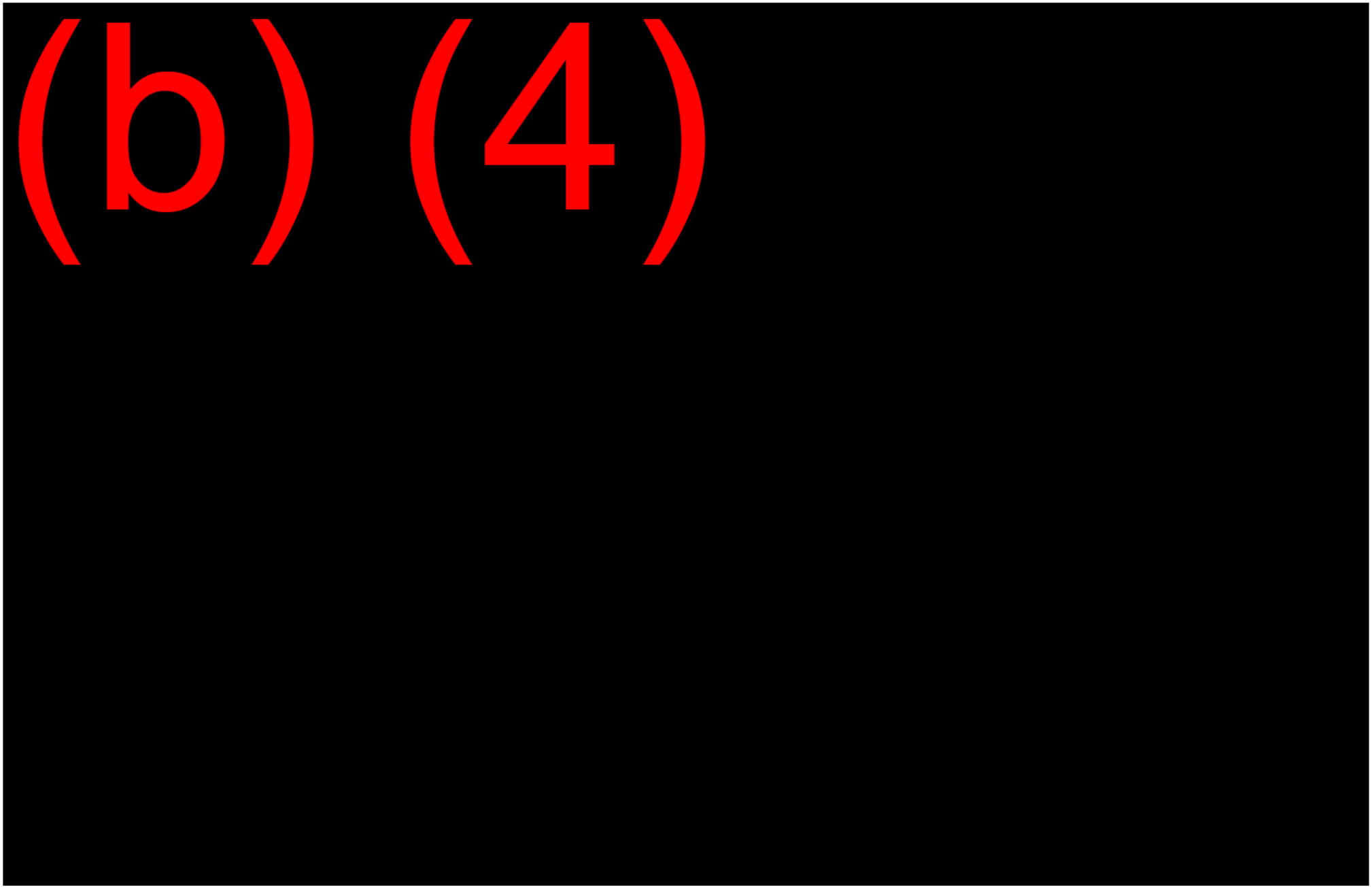
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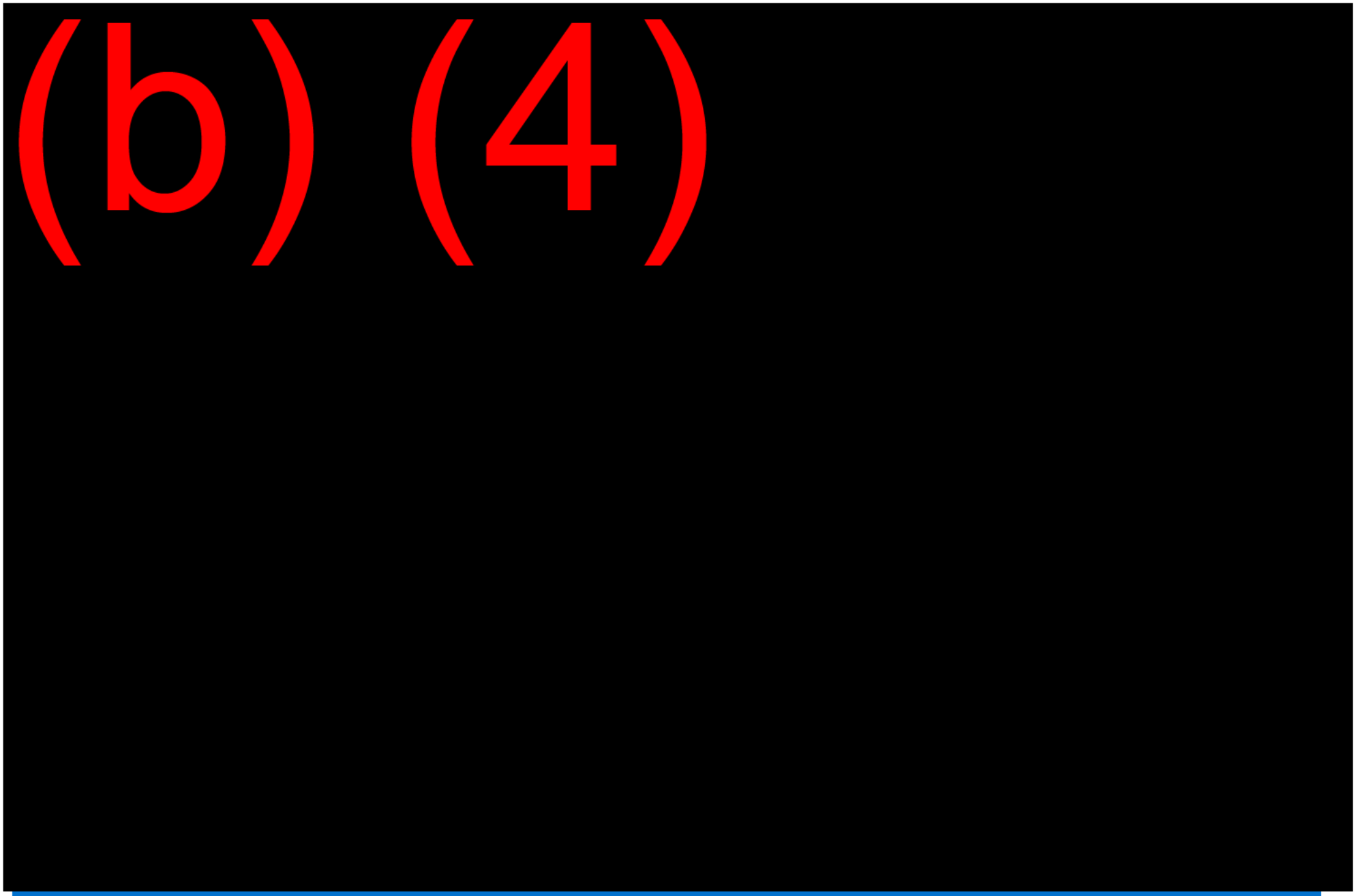
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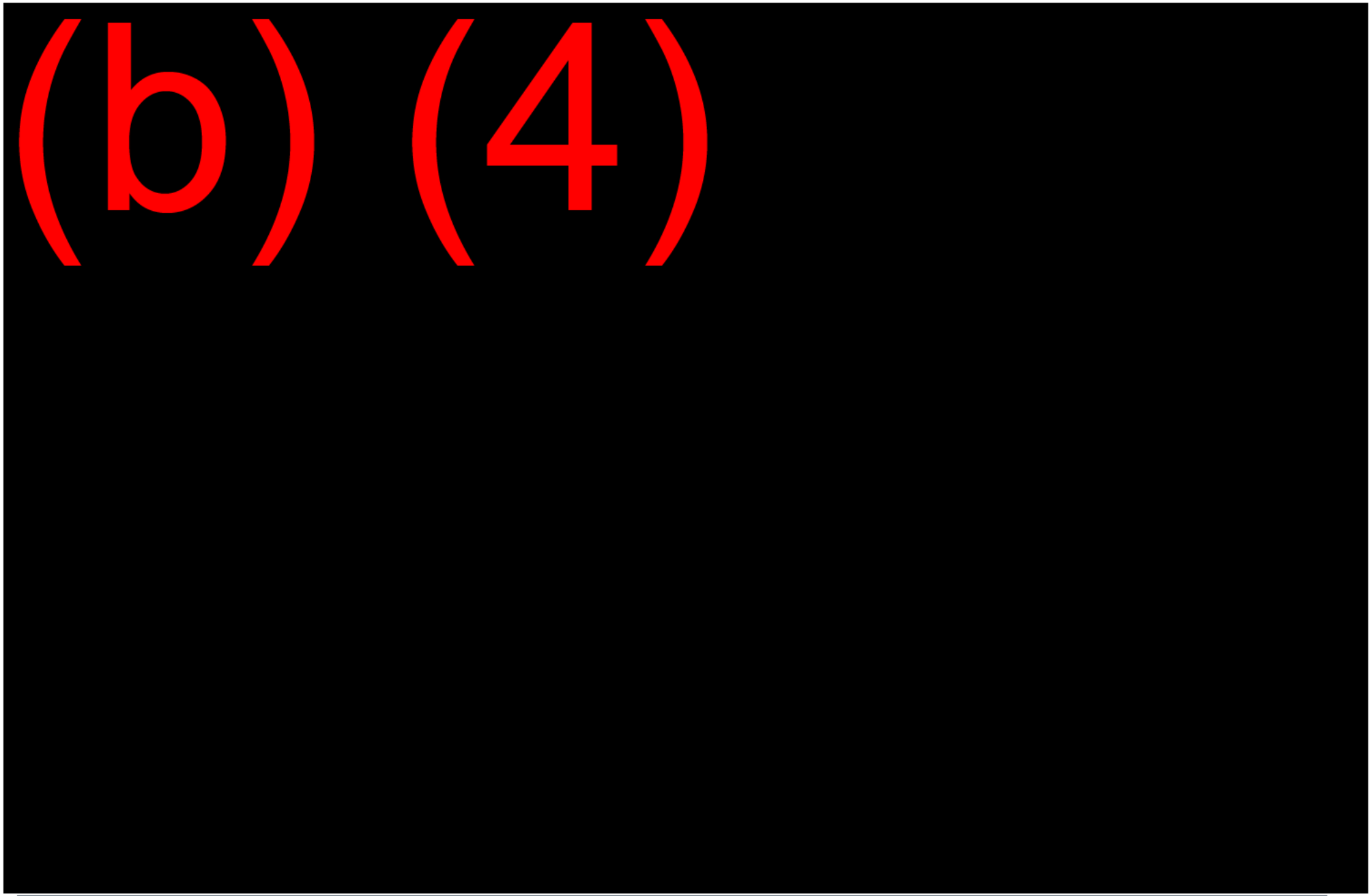

(b) (4)

(b) (4) [redacted]

- (b) (4) [redacted]

For example, if your engines will routinely experience in-use operation that differs from the specified duty cycle for certification, describe how the fuel-metering system responds to varying speeds and loads not represented by the duty cycle

EFI Engine Regulations

- 40 CFR part 1054
  - Certification part
  - Requirements specific to AECD, 1054.205 (b)

(b) ..Also describe in detail all system components for controlling exhaust emissions, including all auxiliary emission control devices (AECDs) and all fuel-system components you will install on any production or test engine. Identify the part number of each component you describe. For this paragraph (b), treat as separate AECDs any devices that modulate or activate differently from each other. Include sufficient detail to allow us to evaluate whether the AECDs are consistent with the defeat device prohibition of §1054.115. For example, if your engines will routinely experience in-use operation that differs from the specified duty cycle for certification, describe how the fuel-metering system responds to varying speeds and loads not represented by the duty cycle. If you test an emission-data engine by disabling the governor for full-load operation such that the engine operates at an air-fuel ratio significantly different than under full-load operation with an installed governor, explain why these differences are necessary or appropriate. For conventional carbureted engines without electronic fuel controls, it is sufficient to state that there is no significant difference in air-fuel ratios.

Auxiliary emission control device means any element of design that senses temperature, motive speed, engine RPM, transmission gear, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

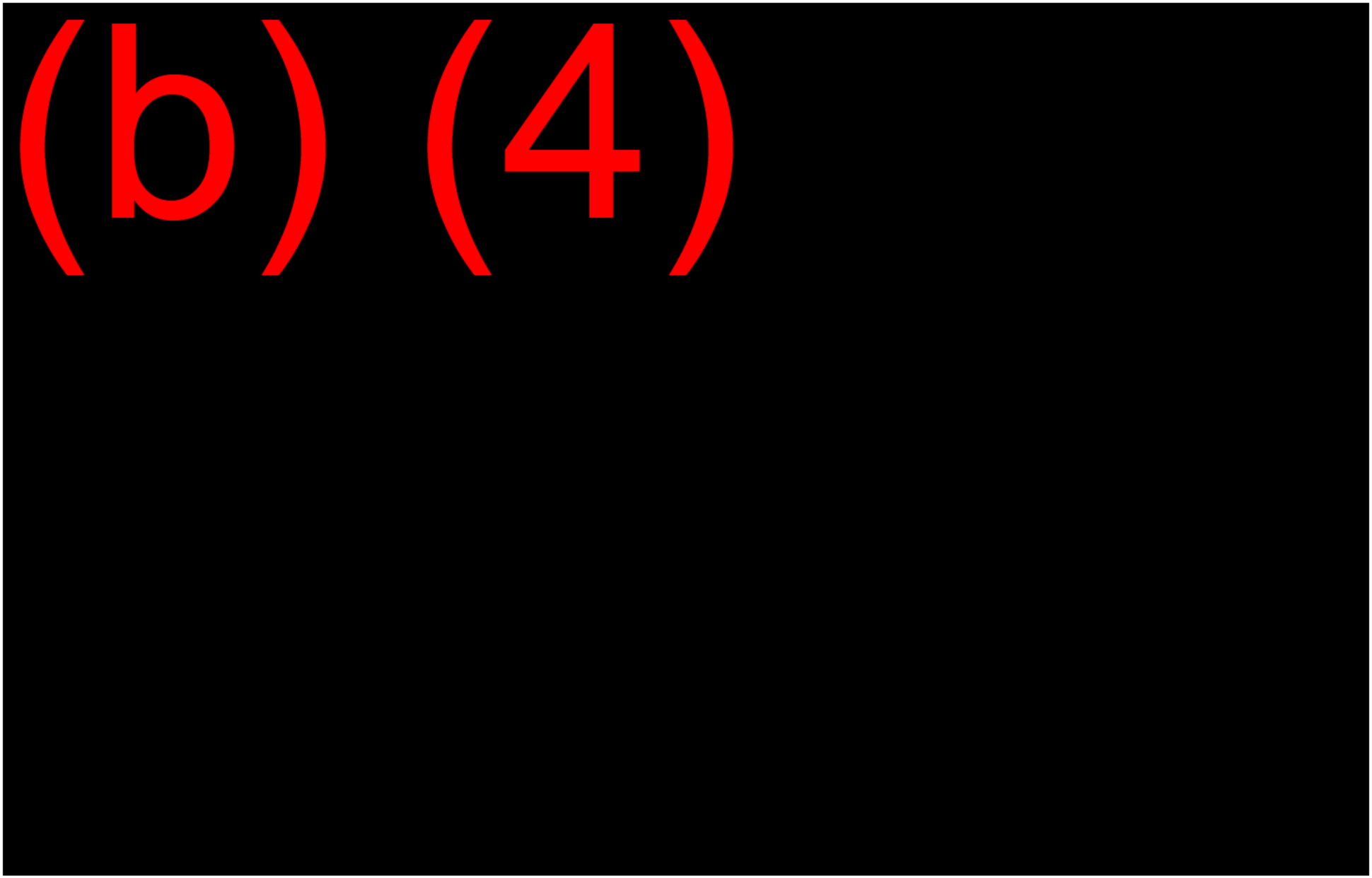
Defeat devices. You may not equip your engines with a defeat device. A defeat device is an auxiliary emission control device that reduces the effectiveness of emission controls under conditions that the engine may reasonably be expected to encounter during normal operation and use. This does not apply for altitude kits installed or removed consistent with §1054.655. This also does not apply to auxiliary emission control devices you identify in your application for certification if any of the following is true:

(1) The conditions of concern were substantially included in the applicable duty-cycle test procedures described in subpart F of this part.

(2) You show your design is necessary to prevent engine (or equipment) damage or accidents.

(3) The reduced effectiveness applies only to starting the engine.

12/4/2015 KOHLER. Engines 3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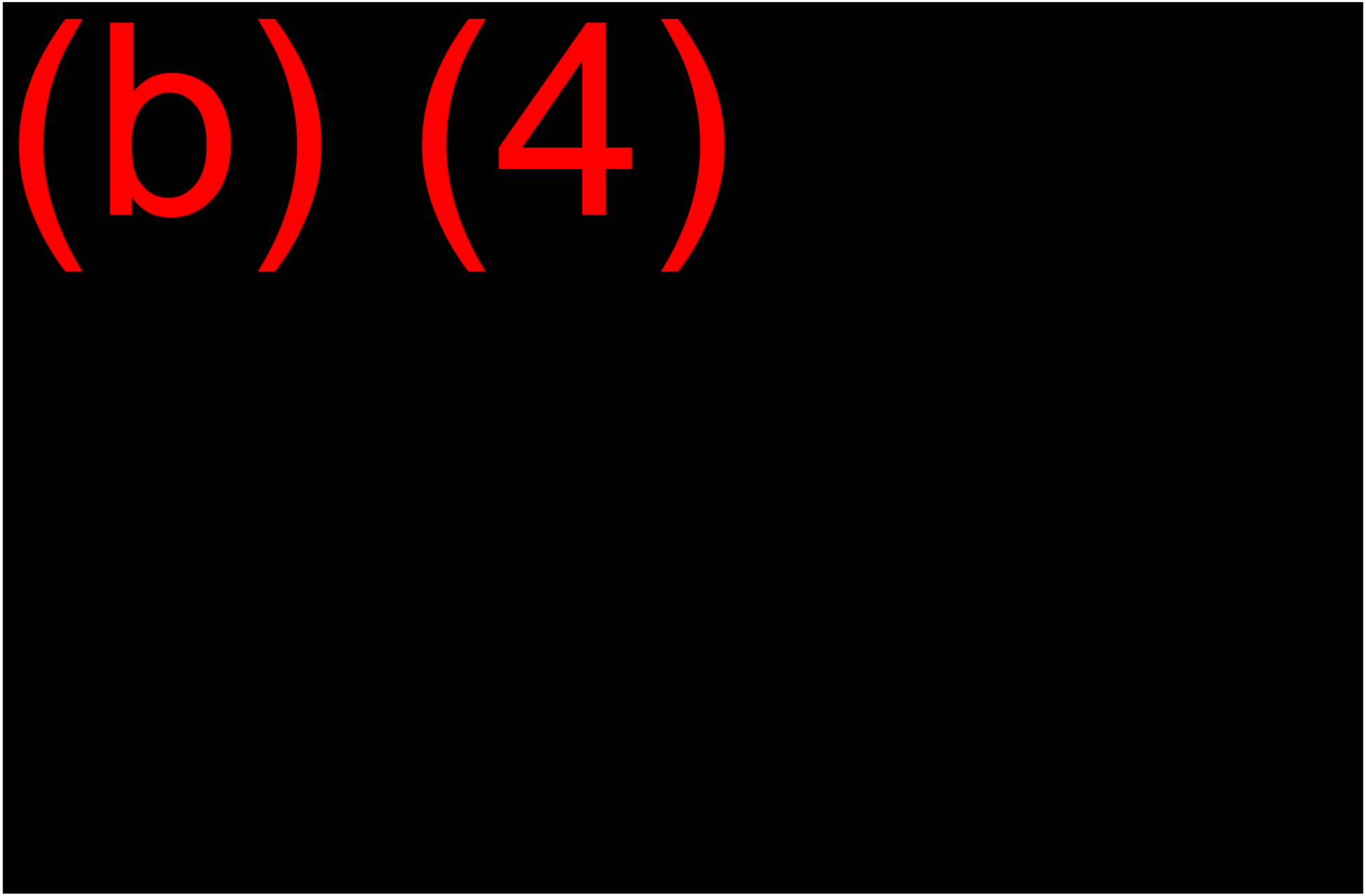
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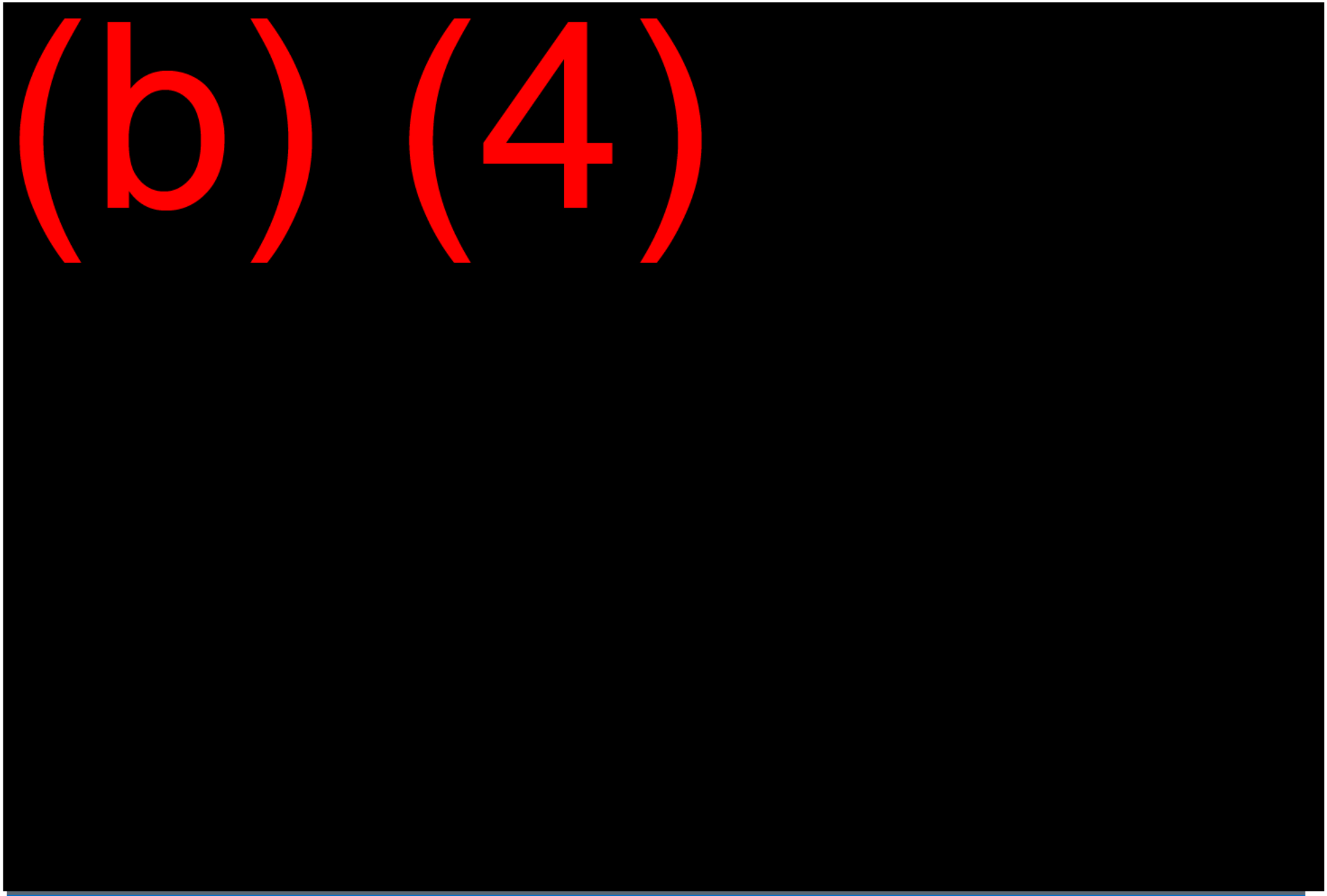
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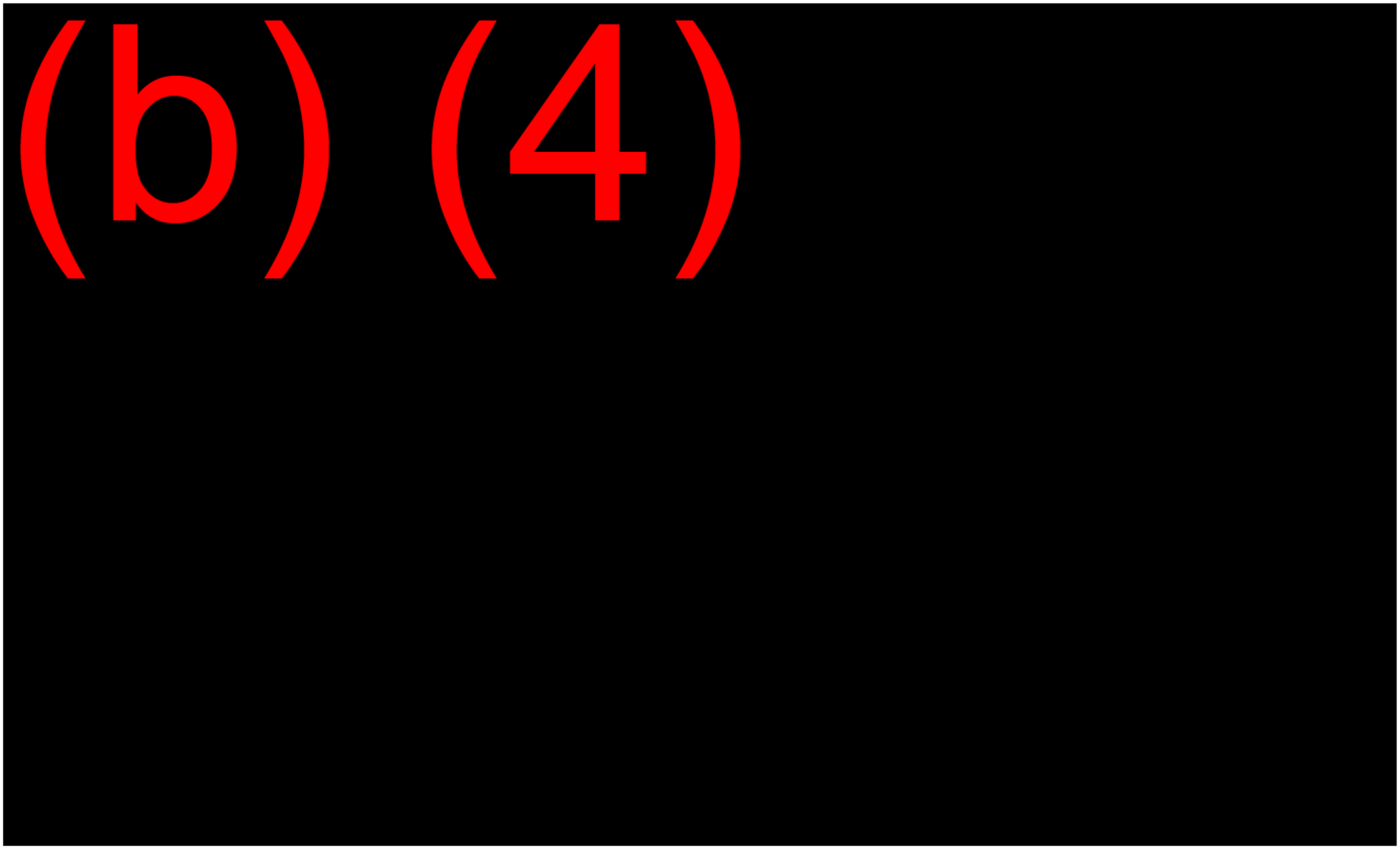
(b) (4) [redacted]

- (b) (4) [redacted]
- Regulatory Changes to Part 1054
  - More stringent emissions standards
  - Revisions to test cycle selection
- (b) (4) [redacted]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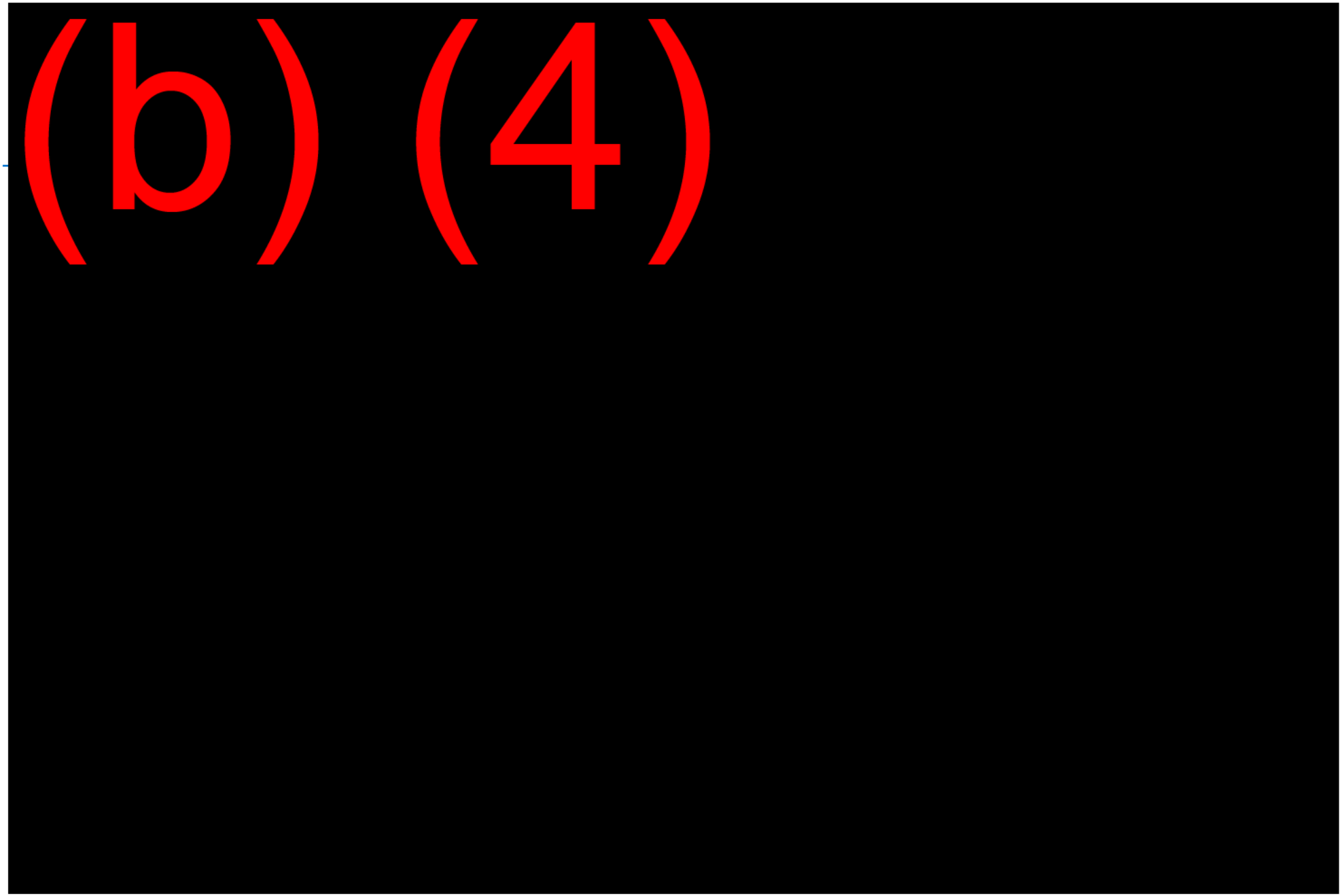
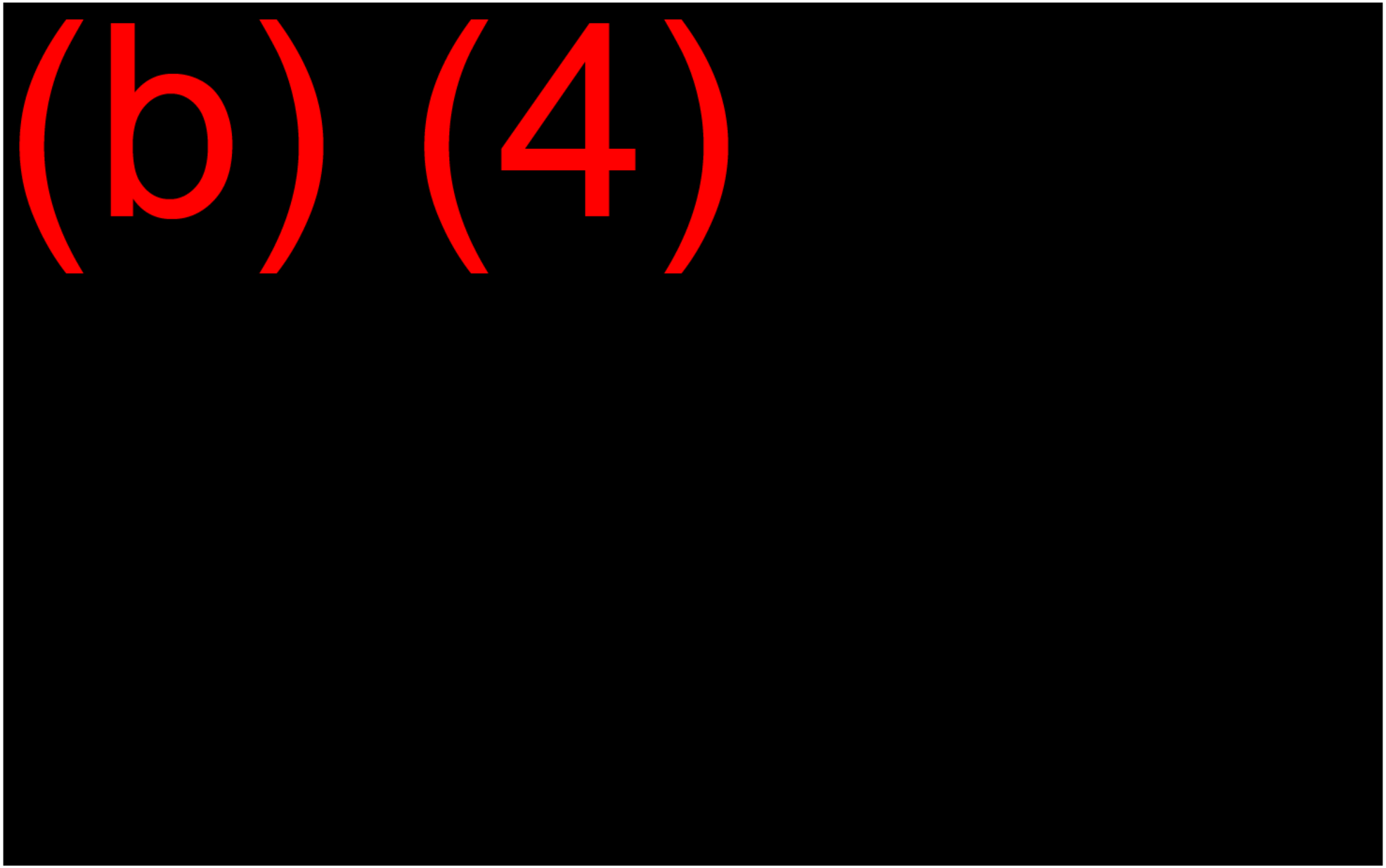

(b) (4)

Agenda

- Objectives for Today and Path Forward
- Overview and Context of SSI/SORE Compliance Issues
- (b) (4) [redacted]
- Impacts and Corrective Actions
- Next Steps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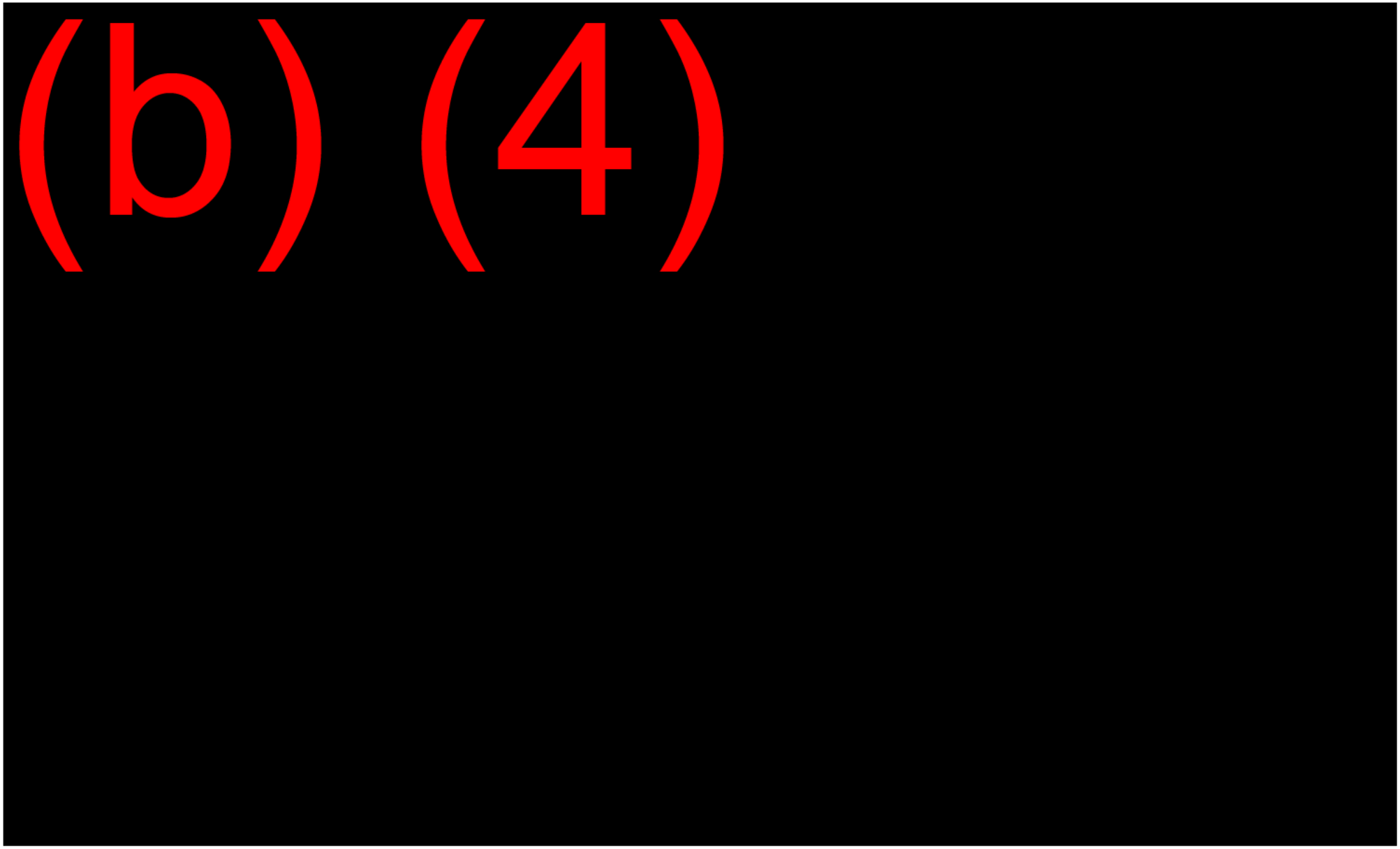
(b) (4)

Agenda

- Objectives for Today and Path Forward
- Overview and Context of SSI/SORE Compliance Issues
- (b) (4) [redacted]
- Impacts and Corrective Actions
- Next Steps

Next Steps

- Considerations
  - Mitigation
  - Self-disclosure policy
  - Economic benefit
  - Gravity
- Schedule